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Executive Considerations in Tool Design and Production

By M. H. Flynn
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IN ABOUT half a century tool designing has grown from the early attempts of the machinist to lessen his own labor by making special cutting tools and work holding devices, to a highly organized and indispensable function of management. The tool designer, once tolerated as a "necessary evil," is now given careful training to prepare him for his work, and he carries the responsibility of designing tools to meet the ever increasing demands for better quality, greater production, and lower costs.

The scope of his work is being extended. Although formerly restricted to jigs and fixtures, he now designs sheet metal and forging tools, foundry equipment, and special machinery and tools for many purposes. Modern developments in the foundry, forge shop, and steel mill also show the result of the tool designer's work. He is still employed devising new methods to do better work and to lower costs, but the ordinary tools used in these departments are standardized so highly that his work is not always required in their production. Many hours may be spent making tools such as match-plate patterns, steel drawing dies, or forging dies for which no drawings are required.

The problems met in preparing to machine castings, forgings, and sheet and bar materials cannot be solved so easily. The constantly changing designs of automobiles, office machines, and similar articles, which must be made in large quantities with interchangeable parts, present difficult problems to the tool designer. This work must be done quickly and accurately to satisfy the demand for speed in preparing for the production of a new machine. It is now standard practice to work out these problems on the drafting board, where the feasibility of many designs may be studied at low cost as compared with the cost of the old methods of making new tools from freehand sketches or without sketches or drawings.

Not many years ago machine-tool builders, engineers, and machine designers wanted nothing to do with tool designing. They gave their attention to new machinery or to the improvement of existing machinery. If special fixtures or tools were required to hold the work in their machines, the designers left to the user the problem of providing them. If the user did not employ a good tool designer, the tools might be made by a machinist or toolmaker who would provide something or other to do the work. Efficient tools have been made by this method, but often the tools were so bad that the work could not be done correctly, and the machine was blamed for the failure. Machines have been condemned and replaced with another make, when the fault was with the tools. Now, however, up-to-date machine, and up-to-date machine tool builders offer tool designing service to the users of their machines.

The old method of making tools without studying designs on the drafting board and relying entirely on the experience of the toolmaker, or foreman, is still in use in many industries. It is a slow, costly method. The tools produced are seldom as good as they should be when studied by the foreman or toolmaker in collaboration with a tool designer. Good ideas which come to a toolmaker who is building up a tool under the old method, often cannot be used because of the cost of

The author of this series of articles has had experience for many years as designer, factory manager, and consulting engineer in the planning of tool equipment for high-production manufacture. The problems of tool production are viewed from the standpoint of the factory executive

The first of a series of articles. The second will appear in an early issue.

discarding the partly-finished tool. When designs are studied on the drafting board, sketches of many ideas may be made quickly and compared in order to select the best before any metal is cut. Carefully designed tools cost less to make, have longer life, and make possible lower production costs than tools made under the old method.

To the tool designer and his method of working may be given a large share of the credit for interchangeable production. The great speed with which new models of machines are prepared for manufacture at present is largely the direct result of the application of his methods.

These results are not entirely due to the tool designer, however. If not carefully planned and directed, the work of both the tool designer and the toolmaker may be costly and far out of proportion to the advantages gained. Many instances may be cited of the production of well designed, well built, excellently working, costly sets of tools that were useless, because of the fact that the management did not plan the whole job properly.

If the tool designer's work is to be successful, the device or mechanism to be reproduced must be designed with his work and limitations in view. The finished tools must be used in the right way. If these things are not done, excessive tool and manufacturing costs may be predicted.

The cost of preparing to manufacture any article usually is underestimated and not given enough careful thought during the development period. If the article is a complicated device, the model and tool costs will be large items. A careful preliminary study of these items will reduce their cost and make this part of the burden smaller. Losses charged against tool designing or making are frequently not due to bad tools but to bad planning. Often a partly developed model is given to a tool designer and he is told to "make some tools." It is not his fault if he makes a fine set of tools that must be thrown away because the device will not work. To avoid this waste certain methods have been developed that bring all departments interested in the success of the manufacturing part of an enterprise into close cooperation. Since this is a study of the tool designer's work, these methods will be described from his point of view.

When special tools were first used to decrease the cost of manufacturing and to make possible the production of interchangeable mechanisms, the owner of the enterprise often designed and made the tools and produced the parts with his own hands. The drop forging industry, for example, began in this way. Many large manufacturing companies are directed by men who not only invented the product and built the business, but who also, in the beginning, made machinery and tools and manufactured the product personally. Tools built by such men were simple and effective, and were made primarily to save labor. In many cases they were crudely designed and built because the owner's time and money were limited. As better tools were required, toolmakers were employed and later, tool designers.

Today the work of preparing for and maintaining production in manufacturing plants is sub-divided under many heads, but whether it is done by one man or many, there will be found: an owner, or manager, who provides plant and capital, decides policies and directs sales; an engineer, who designs the product; a tool designer, who selects machinery and designs tools; a toolmaker who makes and repairs tools, and a producer who uses plant, machinery, and tools to make the product.

When the owner did all of the work, his whole thought

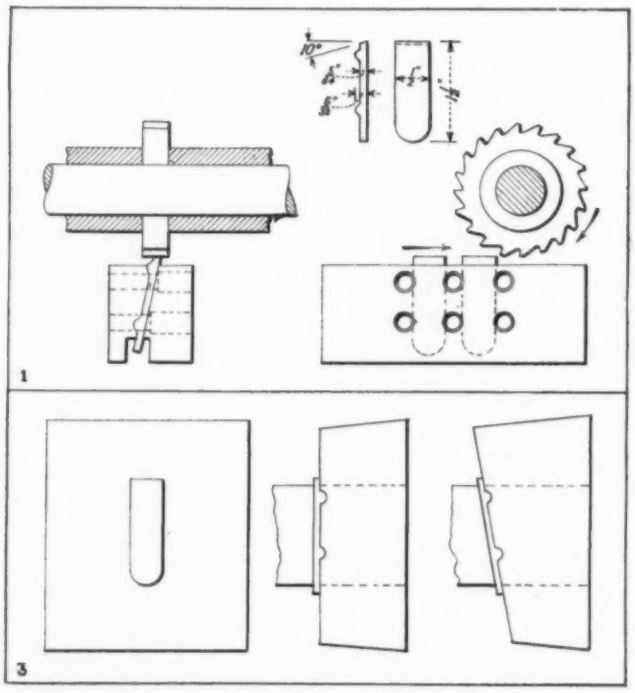


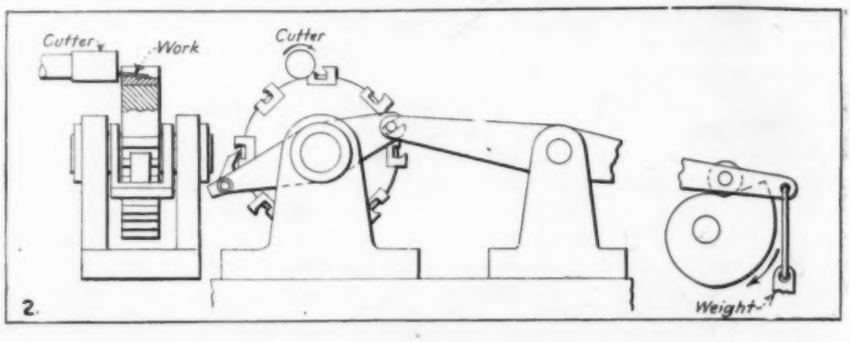
Fig. 3—Producing the bevel in an angular die

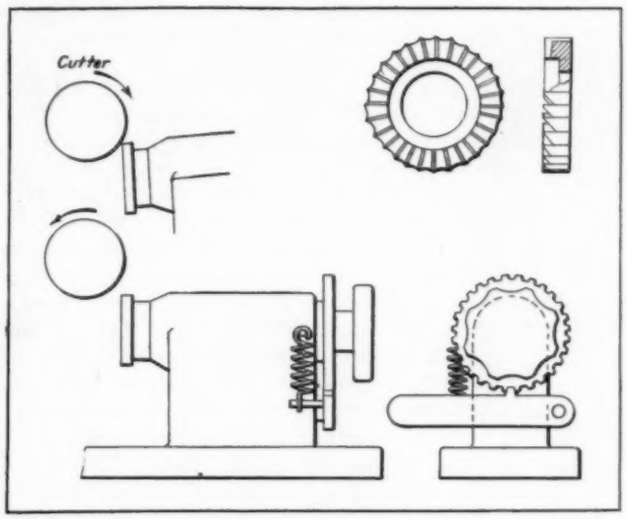
The operation shown in Fig. 2 was finally eliminated by the tool designer by blanking the work in an angular die instead of a flat one, thus saving entirely the work of the milling department.

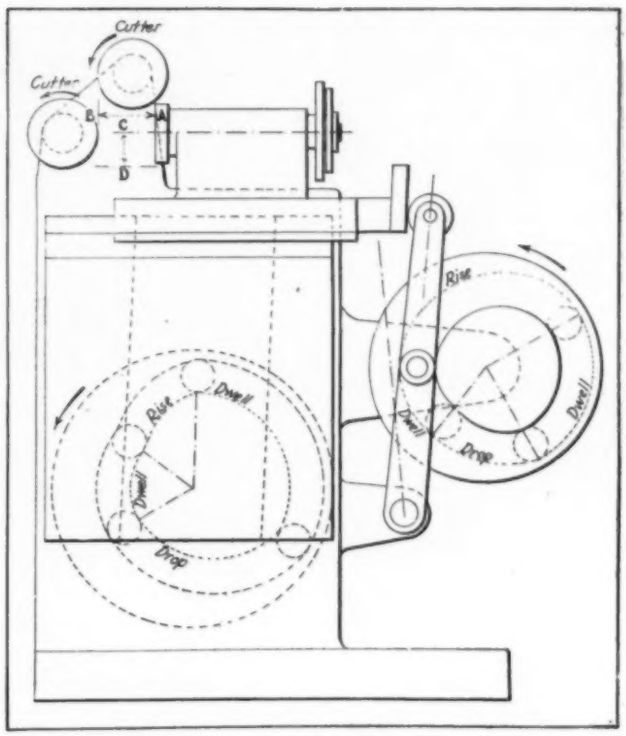
Figs. 1 to 3—Examples of production increases effected by the tool designer

A 10-deg. bevel had to be cut on the end of the sheet-metal piece, which was blanked from ribbed steel. Production required was 1,000,000 pieces per month. For a long time the work was held in a screw-operated vise, shown in Fig. 1, on a hand milling machine and passed under the cutter by a hand lever. With a male operator the output ranged between 300 and 400 pieces per hour and the cost was $0.20 a hundred.

The tool designer's first attempt was the fixture shown in Fig. 2. This fixture was operated by a woman and the production was jumped to 1,500 pieces per hour. The work was dropped into a slotted holder and was carried past the front end of an end milling cutter by the action of a cam, lever, and pawl. The pressure of the cutter held the work down in the slots. When finished, it dropped out on the under side. With this fixture, which cost $500.00, the labor cost was reduced to $0.03 per hundred or a saving of $2.55 an hour.







Figs. 4 and 5 — Reduction to 10 per cent of the original cost was effected by the tool designer in cutting this difficult piece

As shown in Fig. 4, two separate operations were required to cut 28 teeth on the face and 28 grooves on the periphery of a steel ring, when a toolmaker did the work. The bottoms of the teeth notches were cut on an angle to make parallel lines on the flat surface at the top of the teeth. The fixture was rotated by hand to cut one groove at a time. To cut the teeth, the fixture was put on an angle plate and the cutter moved down by a hand lever. Both operations were done on a hand milling machine. Production was 6 complete rings per hour and the labor cost was $10.00 per hundred.

Since it was difficult and costly to cut the teeth in correct relation to the grooves as in Fig. 4, a machine, about the size of a bench milling machine, was designed to make both cuts automatically. The work was put into a chuck. When the machine was started it would run until 28 teeth and 28 grooves had been cut, after which it would stop. The work was passed under the upper cutter from *A* to *B* by means of a cam. Then by the action of the other cam it was run down past the other cutter from *C* to *D*. After this, the first cam drew it back to *A* and the other cam raised it to *C*. While going from *D* to *C* the indexing mechanism turned the work one space. Several such machines were run by one man. Production was quoted at 10 pieces per hour per machine and the labor cost was reduced to $1.00 per hundred pieces or but one-tenth of the cost by the original method.

was directed toward making a finished product with the least possible effort or cost. The owner acting as engineer, toolmaker, and producer, as an engineer designed mechanisms that were made so that he as toolmaker would not be obliged to invent new methods or tools for them or employ expensive machinery or labor in their production. He studied and reworked his design to avoid excessive labor as toolmaker and producer. Complete co-operation then existed without dissension. Men employed now to take the owner's place should work together with the same end in view. Lack of such co-operation has caused many failures.

When the owner did all the work his mind was devoted so frequently to one branch of the work, that which most appealed to him, that other branches were neglected. Enterprises have failed because the owner did not realize the importance of some part of the manufacturing work, and left it in unskilled hands. Owners have forced engineers and tool designers to prepare to make a device that had not been perfected. They have started such work without estimating market requirements or conditions.

The quality and quantity of production have an effect on tool design. A decision concerning them before tool work starts insures the production of the right type of tool. Special machinery and costly tools are often made that are not warranted by labor-saving or production requirements. Owners have had heavy losses because of accepting almost impossible jobs without consulting the tool designer or toolmaker. If the manager does not have the preliminary work done properly, the tool designer's work cannot be made very effective.

Sometimes engineers, also, do their work without understanding the tool or production problems. They do not furnish the tool designer with the essential drawings and lists. They refuse to change costly designs, when slight changes would allow the use of standard parts or fittings, and they make purchasing agents and designers find or produce the special materials. Tool designers and manufacturers of machine parts are often forced to make costly parts that are almost like standard equipment, because the engineer will not allow changes in his designs. Frequently the standard parts are better for the required purpose, as well as much less costly. A closer co-operation and understanding between engineering, tool, and production departments will save a great deal of money for many concerns.

Heavy losses and failures have resulted from poor work or carelessness in the tool designing department, and from lack of co-operation between this and other departments. To keep the cost of designing within his estimate, a tool designer has been known to send out work that he knew could not be made within the estimate of the toolmaker, when a little additional drafting work would have saved many dollars in the toolmaking department. Tool designers and toolmakers sometimes "play safe" in this way at the expense of the owner.

Complete sets of tools have been made to produce mechanisms that were known to be inoperable by the tool designer, and men have been broken mentally as well as financially in consequence. Designers sometimes refuse to expose known errors and allow machines and

tools to be made at excessive cost, when a correction could be made easily if management had provided for co-operation. Toolmakers, on the other hand, sometimes make trouble for themselves by changing the designs of tools without consulting the designer, often trying to use ideas that were rejected for good reasons when the job was studied by the designer.

Faults ascribed to producers are that they condemn tools without trial, use tools on wrong machines, let them be used by incompetent or untrained workmen, and misuse them in many other ways. These things can be avoided by close co-operation of all departments.

To protect his own interest, the owner must enforce co-operation. To guard against waste and to obtain the desired co-operation in preparing for and maintaining production of an article, where tool designing is required, many systems have been set up. Each manager has his own methods, and solves the problem in his own way, but with whatever system is used there are certain things that may be done that will be found helpful. These things should be done in the following order in which they are listed, although some of them may proceed concurrently:

1. Make a model of the article to be manufactured.
2. Redesign the article, if necessary, to cut manufacturing costs and to meet market requirements.
3. Determine the probable volume of production for certain periods, and select the type of tools to be made to suit the volume of production.
4. Make a part list of the product.
5. Establish a production system to control the tool designing and tool making and manufacturing schedules.
6. Make a detailed drawing of each part.
7. Make an operation list for each part and assembly.
8. Make a list of tools for each operation.
9. Design tools.
10. Make tools.
11. Test parts made in tools by assembling.
12. Make parts in production.
13. Assemble parts.
14. Test product on market.
15. Redesign product to meet market and manufacturing conditions, and revise manufacturing limits.
16. Revise tools.
17. Replace worn tools.
18. As production increases change the type of tools for higher production and redesign tools to take advantage of the experience gained in making parts, to get higher production and lower costs.

Although the tool designer's work appears late in this list, he is interested in the whole program. His work should be considered, and he should be consulted under nearly every item in this list. The success of many manufacturing ventures depends largely upon the work of the tool designer, but the finest set of tools is worthless if some of the items in this list, which are not part of the tool designer's work, are neglected. For instance, if item 2 is not taken care of and tools are built for a mechanism that has not been carefully studied with the manufacturing limitations in mind and with the requirement of the consumer carefully considered, the tools may have to be discarded soon after the product goes on the market.

Large losses of this kind have been caused by building tools to make parts as they were found in the inventor's model. Sometimes large numbers of tools have been made even before the model was finished.

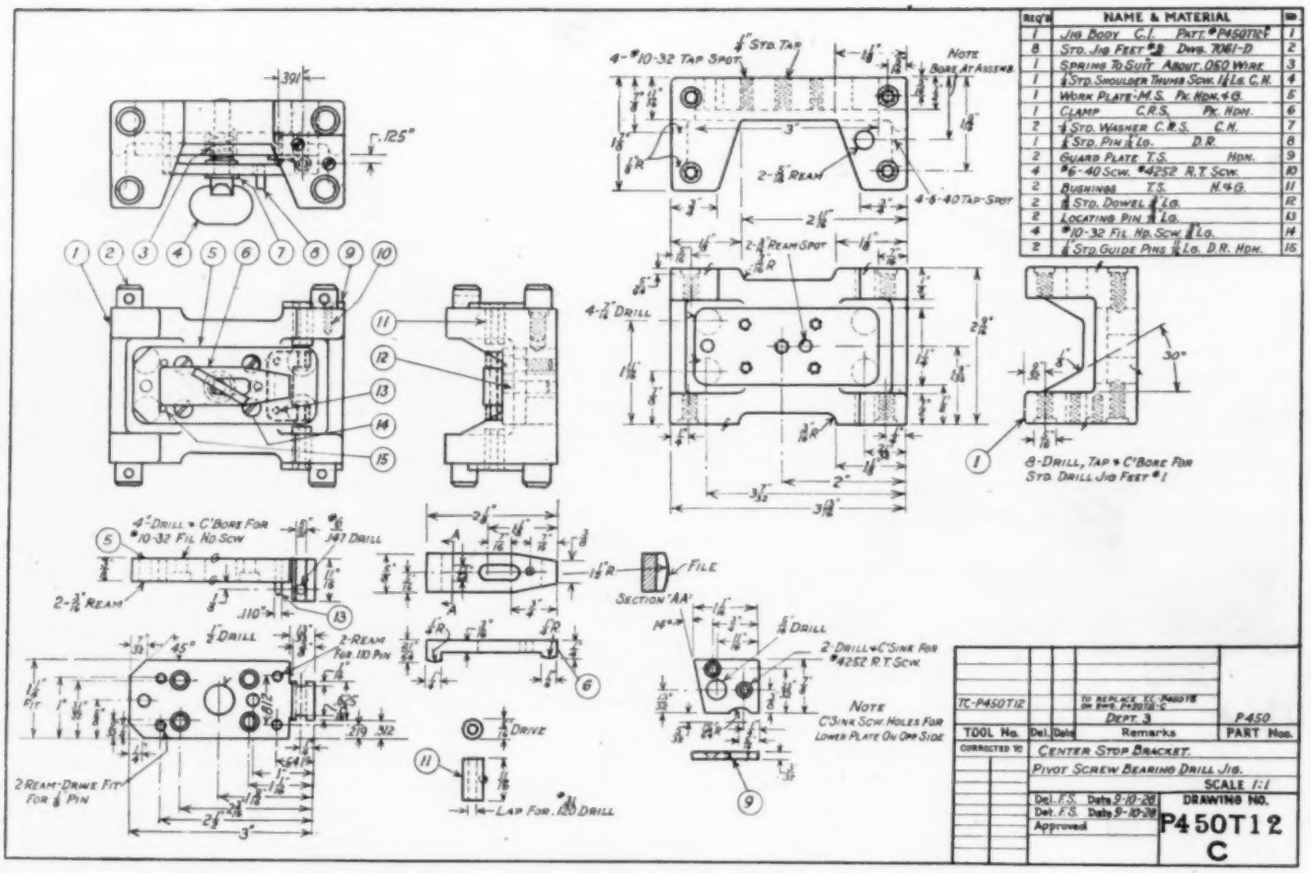


Fig. 6—Typical tool drawing giving full building instructions to the toolmaker

Such tools usually go to the scrap pile.

If a production estimate is not made, as suggested in item 3, before building tools, the tool may be either too good or too poor, causing losses either in tool or manufacturing cost. For the same reason the correct type of tools for the volume of production required should be determined. If a part list of the product is not made, tools for some parts will not be ready when needed, and production will be delayed.

If a production system is established as soon as work begins, the tool designing and toolmaking can be scheduled and controlled as well as manufacturing operations. The part drawings, operation list, and tool list all should be made and checked carefully before tool designing starts. The tool designer is vitally interested in all of this work, which should be performed by the owner and engineer, with his needs in mind.

Fig. 7—Although this tool design department was laid out over twenty years ago, its features were so advanced that it is still a model

Drafting tables are arranged along the windows and have a reference bench at the left. The file clerk is in front, and the chief engineer in the center. The model making room is at the left; drawings vault, at the right.

After the device has been produced and marketed successfuliy, the tool designer will be called upon to revise tools to suit new designs, to redesign tools to replace worn tools, and later, to provide better types so as to increase production and reduce costs.

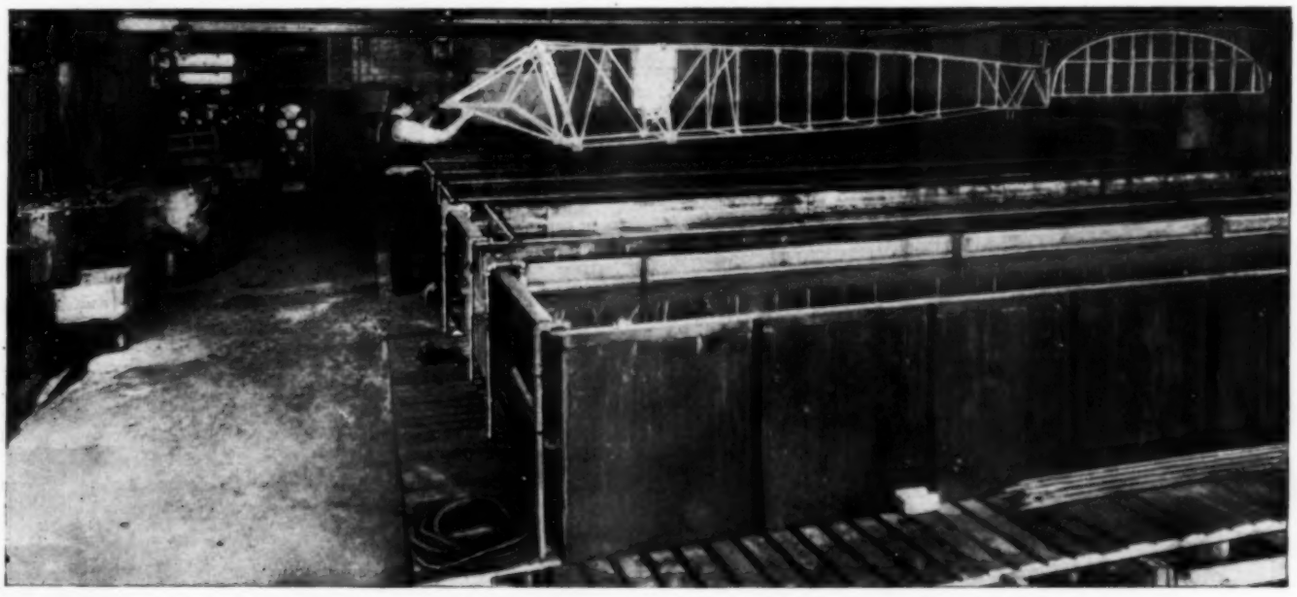
The value of this method of preparing for and supervising tool designing and production has been demonstrated in actual practice. The method is simple and to many it may seem the obvious thing to do, yet it is surprising how many owners attempt to manufacture a new product, or to make a change in an old product, without performing elementary items on the list.

Plating a Complete Fuselage

THE airplane is affecting other industries in much the same way that the automobile did, particularly in its earlier stages. Electroplating is one of the industries in which airplane parts are now beginning to appear, not to be highly polished for decorative purposes, but to be protected from rust.

To handle work of this kind, in any size likely to be called for, the Bar-Rusto Corporation, of Kansas City, Mo., has installed plating tanks that will take the completed fuselage of an ordinary plane, as shown in the illustration. The tanks are 30½ ft. long, 5½ ft. wide and 5 ft. deep and are served by an overhead traveling crane.

These tanks handle not only the completed fuselage of steel tubing but also such parts as tail surfaces and rudder frames. In this way the whole fuselage can be cadmium plated after completion, as illustrated below.



Cadmium plating airplane fuselages after they have been completely assembled

Overtime vs. a Longer Working Day

"WE ASKED you to come to this conference, Mr. Holland, because we're in a jam, and want some good outside counsel." It was general manager Rhodes of the Globe Typewriter Works, speaking. Around the table were Banks, the superintendent, two other shop executives, and the personnel manager.

"Our orders from the executive sales office are to increase production thirty per cent to meet increased sales demands. It means a big increase in shop employees, and we just can't get the men. Oh, we can take care of the rough machine operations and light assembling, all right. Most everyone in the plant has a sister, or cousin, or uncle he wants us to take on. But these people are unskilled. We've got to have high-grade toolmakers and mechanics to make the new sets of jigs and fixtures we need for the extra production. And it takes months and years before you can break in men to be good polishers, grinders, machine adjusters, platers. Then there are the jobs of aligning and final inspecting. It takes two years to make a good aligner, and new men don't want to give the time to learn because they can't use the knowledge anywhere else. It isn't a trade. It's simply specialized skill."

"My proposal, Mr. Holland, was to change back to the ten-hour day," spoke up Banks. It's all right to talk eight hours or five-day weeks when the work can be adjusted to it but it's different now. We're managing this plant, and we ought to be able to set the hours of work to suit ourselves."

"Can you meet the extra production with the ten-hour day?" inquired Holland.

"That I can't say off-hand. But if we can't we might call for overtime and pay something extra for it."

"Banks, let's hear what Mr. Holland has to say. I've given you my answer that the ten-hour day is likely to start something. We had that during the War. And we'll have the devil's own time with soap-box orators at the gate every noontime and indignation meetings down town every night. Nothing doing!"

"Well, gentlemen," began our friend Bill Holland, "it looks like you want something pretty definite from me. Seems to me you're both right and both wrong. Suppose I review some of your own history and let you judge for yourself.

"Remember back in 1914, Mr. Rhodes, when tough times came, and you said you just couldn't lay your men off like everyone else was doing? If I remember rightly you kept pretty much the whole force and reduced the working time to five days, then four, then three and a half. Everybody had something to keep his family on, and no one was thrown out into the street to starve. Maybe you've forgotten that, but I guess your men haven't, and I know your foremen remember it. Most of them are with you yet.

"All right, now, why not try that backwards, and see if it doesn't work? Only, be sure that your men understand it as a temporary condition —that the present day is the standard."

"That's certainly a new slant, Mr. Holland, and I'll bet they won't ask for a bonus wage for overtime, either," spoke up Lewis, the production chief.

"Maybe they will see the light and save the extra money they earn on overtime for a rainy day when business isn't so good," suggested Banks as a sly dig at his colleagues.

"Well, that's a detail, Mr. Banks," answered Holland. "The main point is to tide over this rush season without making your men feel that you treat them as machines where you shift the belt on and off."

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

Discussion

Getting Details on Overhead Costs

One plant, with whose practices I am familiar, has gone as far as to keep a card record for each belt, which shows its complete history. The results have justified the expense, not only by cutting the cost of belt maintenance, but also by

reducing the loss through belt failures. Each card shows the location of the belt, the exact length, so that a new belt may be made without remeasuring, the width, whether single, double or triple, the make, price, date of installation, and the date and repairs made each time the belt needed attention. These records soon showed that a few belts were causing most of the trouble and steps were taken to find remedies. In some cases drives were completely redesigned, while in others, simple remedies provided the cure, such as installing wider pulleys, or substituting double belts for single, or triple for double. Any belt which had too many entries on the card was given special study.

In some cases, where a change in conditions seemed inadvisable, the problem was put up to the belt makers to furnish belts for the special service, and the results obtained were highly satisfactory. A striking example was a large belt which had to run over a pulley of small diameter, at a high speed, and for brief periods exerted an unusually hard pull. To add to the trouble, the belt was under a continual spray of water, and no one was able to devise a way to keep it dry. A belt for this service cost about $150 and the average life was a month. To correct the trouble, the manufacturer furnished a belt for $200 which was guaranteed for a year, and actually lasted for three.

Numerous other examples could be given of the economies effected through knowledge of details. What has been said about belts applies also in principle to other items of overhead costs. Economies are impossible without knowledge of details. —C. J. MORRISON.

Idle Machines and Net Profit

I have in mind a case where one twelve-station automatic machine and one three-station automatic machine, together requiring the attention of only one man, have taken the place of five machines working in a row, each requiring an operator. The output required is obtained by working the machines five hours a day. It could be increased at least 50 per cent if necessary, by speeding up the equipment. But there seems little probability of greater production being required during the period over which the machine part made on the equipment is likely to be required in its present form, say five years. The management is satisfied, because the new machines are saving money. The investment cost will be paid off in a year by the saving in labor alone, and five standard machines are set free for other work.

Nevertheless, it is true that many executives spend more than is necessary on new machines, forgetting that they must be able to show not only that the expenditure is justified by savings over previous methods, but also that the saving could not be obtained by the use of a little more ingenuity and a little less money. Two lathes, standing side by side in a certain shop, were in continual service during two shifts daily, turning out the same machine part. A considerable increase in output was required, and the first proposal was to scrap these machines and replace them by two of greater capacity. Instead, it was decided to true up the slides on one and use it for finishing, and to use the other for the roughing out. On the latter machine a four-step cone was replaced by a single pulley, three gearwheels and several bolts were replaced by similar parts of higher tension steel, and a square turret was fitted on the saddle. This machine took a roughing cut twice as heavy as that for which it was designed. The other lathe finished the parts at a much higher speed than before. By the time the two machines were no longer serviceable the article turned out was no longer required. —H. JAMES, *England*.

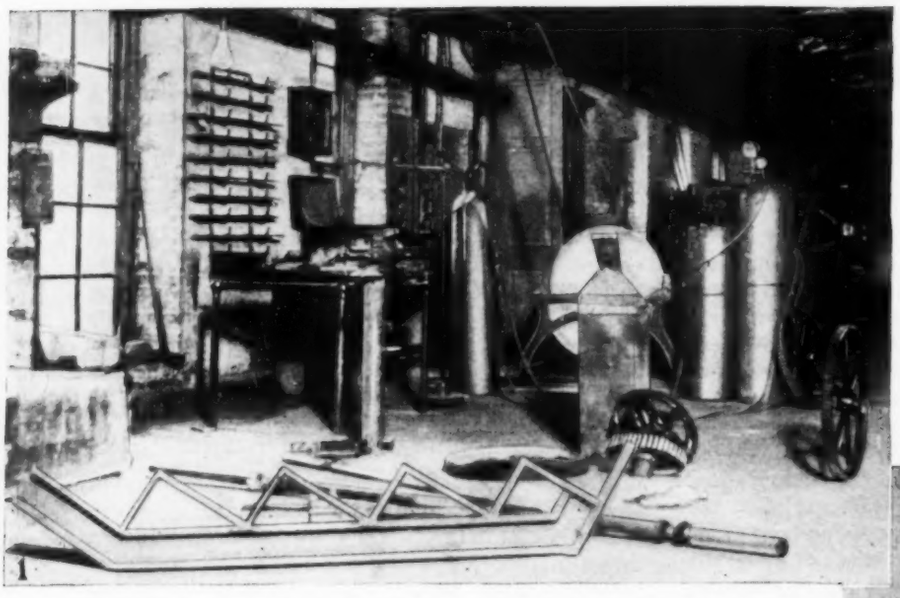
Should the Buyer Specify Design or Results?

The supplier of a machine may consider that if he can provide one which will give a specified production with the necessary accuracy, that is the end of the matter. But he must not lose sight of the fact that throughout the life of a machine it forms an advertisement for him, and, therefore, it is to his advantage that it should retain its efficiency.

The user wants to know how long the specified output can be maintained, and at what cost, what breaks there may be in production, and what are the weak points about the machine, if any, so that trouble may be avoided, or reduced to a minimum. His experience may indicate that certain types of equipment are best suited to the class of labor which he employs, and that other types will mean that he must hire new operators, and perhaps maintenance men, at higher wage-rates. As the buyer, he has every right to specify what he shall receive. But if he asks for a non-standard article he must expect to pay a special price for it, and if he should insist on a design which the supplier does not consider the equal of his standard line, he cannot expect that supplier to give his standard guarantee.

There are buyers who have fads, but not all changes in design are fads. There are more opportunities to discover faults in equipment during a long period of use, than by a mere study of the new machine in the builder's shop. For this reason, most makers welcome data from users of their machines, although many troubles are the result of abuse of the machine rather than poor design. Given a maker with a reputation to maintain, it is generally better for the buyer to state the results to be obtained, and to leave details of the design to the supplier.

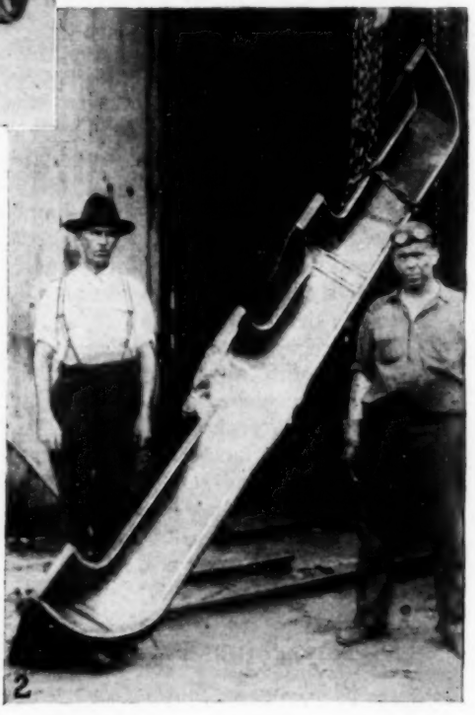
—A. F. GUYLER, *England*.



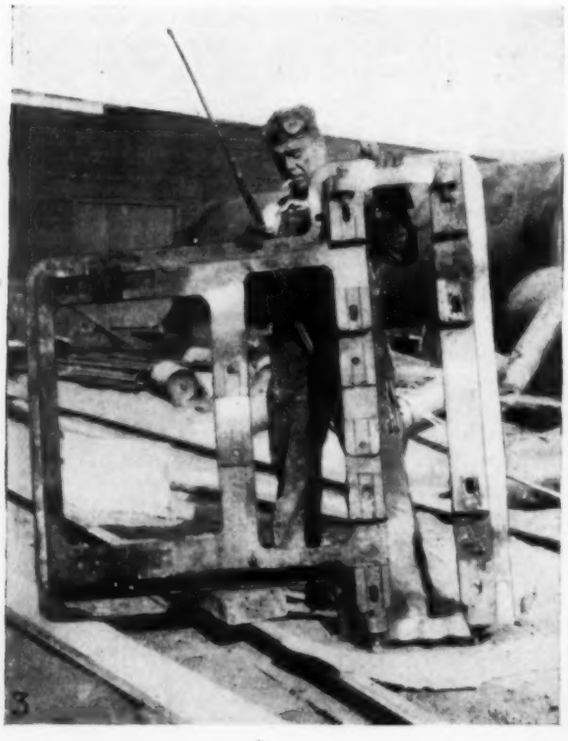
Isolated plants, mills, and mines are becoming keenly alive to the advantages of welding. Where the work justifies it, they are setting aside a space for a central welding shop such as shown in Fig. 1. In some cases they hire a competent welder and keep him busy at other work when not occupied with welding. Previously it was necessary to shut down a mill or mine until new parts could be secured. Now the lost time rarely exceeds over night

Photographs by Courtesy of The Linde Air Products Company, Inc.

Welding in Isolated Shops

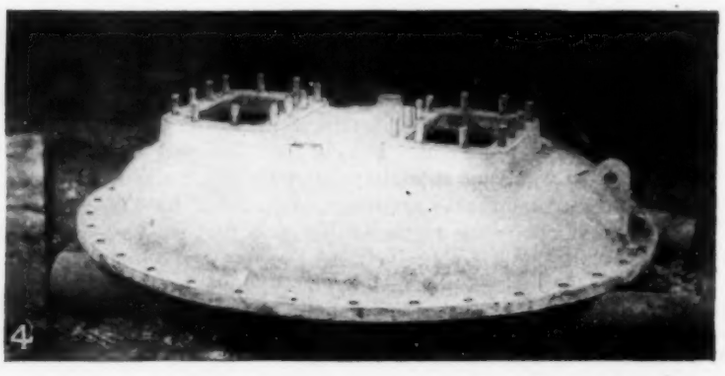


When the mine pump stops, the mine shuts down. The cross member, Fig. 2, of a large pump broke. Its shape made preheating risky, so it was clamped to a surface plate and welded with bronze welding rod, in less than five hours. It was held in position until cold, and then replaced on the pump



An example of time saving is shown in the welding of the frame of an attrition mill, Fig. 3, which was fractured in eight places. While efficient, the mill was of an obsolete type and it was practically impossible to replace the frame. It was preheated in a loose brick furnace, welded without removal, allowed to cool, and was ready for service in a few hours

Brass castings are difficult to weld, and also to preheat without new breaks developing. A condenser cover of this metal, Fig. 4, was rested on two 6-in. pipes in a loose brick furnace heated with charcoal, and welded. The next day it was back on the job



Proposed Standard Practice for the
Inspection of Gears

Tentative American recommended practice is submitted by the American Standards Association for criticism and comment

UNDER the joint sponsorship of the American Society of Mechanical Engineers and the American Gear Manufacturers Association, the American Standards Association is offering for comment the following proposed American recommended practice for the inspection of gears, including worms, hobs and other cutters. The work of compiling this proposed standard was undertaken by Sub-committee No. 9 of the Committee on the Standardization of Gears. G. L. Markland, president of the Philadelphia Gear Works, is chairman of this sub-committee, and all communications in regard to the proposed standard should be addressed to him in care of the American Society of Mechanical Engineers, 29 West 39th St., New York. Tentative standards on the 14½-deg. composite system and the 20-deg. stub involute system have been approved, and a proposed standard on 14½- and 20-deg. full-depth involute systems is now under consideration, the present standard being the third to be submitted by the gear committee.

I. Gear Inspection

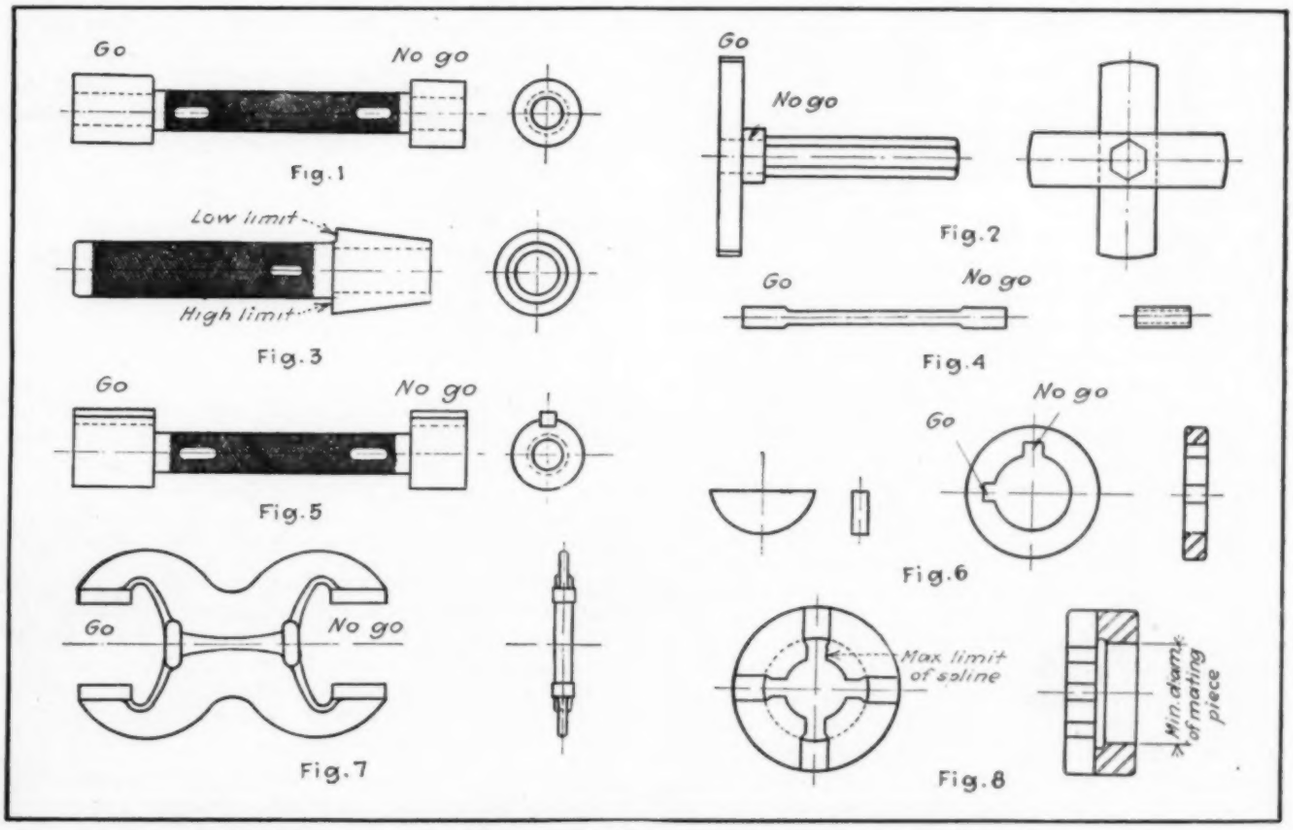
1. *Cylindrical Holes.* Cylindrical holes up to 3 in. in diameter should be inspected with "Go and No Go" plug gages (Fig. 1), the Go end to be the same as the smaller limit and the No Go end the larger limit given on the customer's drawing.

For holes between 3 and 12 in. in diameter, bar gages (Fig. 2) should be used, in which there are two bars approximately at right angles to each other, held together by a handle pressed into a hole in the middle of each bar; one bar being the Go and the other the No Go. The nature of the piece being inspected, principally the length through the bore, should determine the length of the handle and whether the bars should be close together, or at opposite ends.

Holes larger than 12 in. in diameter should be inspected with measuring rods, or inside micrometers set to vernier calipers, or by standard measuring machines.

No wear should be allowed on gages beyond the limits on customer's drawings.

2. *Tapered Holes.* Tapered holes should be inspected with tapered plug gages (Fig. 3), and the quality of fit determined by lightly coating the gage with red lead, or Prussian blue, and a full bearing should be shown. Proper depth of reaming or grinding should be indicated by a stepped shoulder located at either end of the



Figs. 1 to 8—Various types of gages for inspecting hubs, shafts, keyways and splines of gear mounts

plug as the case may require, the height of the step and relationship to the taper agreeing with limits given on customer's drawing.

3. *Keyways.* Keyways, single or multiple, for straight and tapered holes should be inspected for width by using Go and No Go flat limit gages (Fig. 4), gaging the width only. For alignment, a plug gage (Fig. 5) with a key or keys should be used, with the diameter of plug and width of key enough smaller than the low limits to meet the requirements of the work in hand. The key should be long enough to reach the entire length of the keyway, the height of the key being equal to the customer's low limit. If the maximum depth is important, a similar gage should be used as a No Go, having a height equal to the maximum shown on the customer's drawing.

4. *Keyways for Woodruff Keys* should be inspected by using a hardened gage (Fig. 6) similar in shape to the key, slightly thinner than standard, and sliding a keyseated ring gage over the key when in place in the keyway. Two keyseats may be put in the ring gage to agree with the depth limits on customer's drawing. For width of keyway in shaft use a Go and No Go flat limit gage (Fig. 4), both ends of which should agree with customer's limits.

5. *Shafts.* Splined shafts should be checked for width of spline, root, and outside diameters, using a Go and No Go snap gage (Fig. 7) made to dimensions given on customer's drawings, or using a micrometer. For accuracy of spacing use a ring gage (Fig. 8) having one portion ground to the minimum limit of the large diameter, bottom to bottom of keyways, in mating part, and at one end a slotted portion with a diameter of hole equal to the minimum diameter of the bore of the mating part and made with slots of width equal to the maximum limit of the spline on the shaft.

6. *Shifter Grooves.* Shifter grooves should be inspected for diameter at bottom of groove by using a Go and No Go snap gage (Fig. 7), slightly thinner than width of groove, and made to dimensions on customer's drawing, or by using a micrometer. If a fillet is called for, round the edge of the snap gage enough to clear. For width of groove use a Go and No Go flat limit gage (Fig. 4) made to limits on customer's drawing.

7. *Small Size Spur, Helical and Internal Gears.* Smaller sizes of spur, helical and internal gears should be checked for pitch diameter, eccentricity, and irregular teeth by inspecting on a hand stand, the essentials of which should be rigid in construction. It should have one rigid and one freely sliding head, so arranged that the movement of the sliding head will actuate a dial indicator. Hardened master gears of proven accuracy should be used. The studs on which the work and master are mounted should be at right angles with the surface on which the sliding head moves, and parallel with each other within 0.002 in. in 12 in. The diameter of the work stud should equal the diameter of the Go gage and the stud in the master gear should be about 0.00025 in. less than the hole. This stand may also be used for determining quality of tooth bearing.

For the determination of noise, a power stand should be used, the essentials of which should be the same as the hand stand, except that one spindle should have power applied in either direction, and the other spindle provided with a brake. The indicator should be omitted and the movable head controlled by a screw adjustment

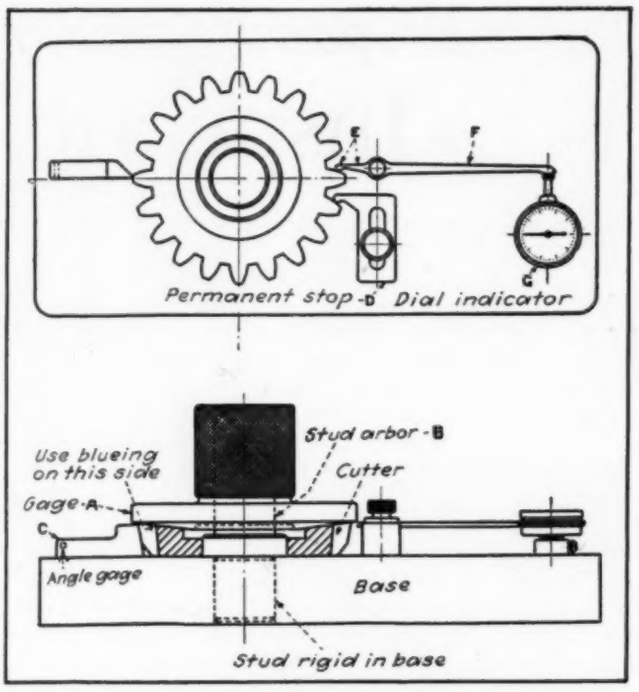


Fig. 9—Recommended fixture for testing various characteristics of shaper-type gear cutters

with micrometer collar and should have a clamping screw for locking the movable head. Master gears in six pitch and finer should be within an eccentricity limit of 0.001 inch.

In disputes concerning eccentricity, where master gears of proven accuracy are not available, a hardened gear with teeth cut away so as to have but one tooth in engagement at a time may be used by rolling through the arc of contact, and then ratcheting to the next tooth to be inspected.

8. *Bevel Gears.* Bevel gears should be inspected on hand or power stands for quality, and on reversible power stands equipped with brake, for noise. These stands should be rigid in construction. The belt pull should be downward rather than upward, so as to seat the movable head rather than pull away from the bearing. The spindles should lie in the same plane and be at right angles with each other within an error of 0.002 in. in 12 in. In straight tooth bevels, conical pointers may be used to prove whether teeth are radial or not.

The above applies to such gears as are used in automotive construction and not to the larger mill gearing. Questions of tooth bearing should not be determined in the final assembly in case of dispute, but by inspection on proper test stands, as noted above for spurs and bevels. The holes in collets or bushings for holding stem gears should be equal to the maximum shaft limit, plus the smallest amount that will allow the size to enter.

9. *Backlash.* Backlash is the play between teeth of a pair of gears mounted at a specified center distance. A satisfactory way of checking this amount would be by the use of standard feelers. The backlash of an individual gear may be determined by substituting a master gear of standard thickness of tooth and pitch diameter in place of the mating gear.

10. *Disputes.* Disputes over accuracy of measuring instruments, forms of test stands, methods of checking, etc., may be referred, at the request of buyer or seller,

to a committee of three, one selected by the buyer, one by the seller and they to select a third agreeable to both.

11. *Involute Curves.* In order to determine the accuracy of the involute curve, it is necessary to have some instrument which will check this curve in the same manner as it is unwound from a base cylinder. An instrument of this type should have a straight edge rolling on the base circle of the gear and an indicator fastened to the straight edge, the indicator point being in contact with the gear tooth to be tested.

As the straight edge is moved along it will roll the base circle and also the gear attached to the base circle, and the indicator which is in contact with the gear tooth should register zero if the involute curve is correct. If it is not correct, it will show the amount of inaccuracies.

It is necessary that a gear have an accurate involute curve in order to function properly and the involute curve testing instrument can determine this, also whether a gear has been cut off-center and whether the pressure angle of the gear is correct.

12. *Angular Velocity.* If a pair of gears are properly mated, they should function with uniform angular velocity but in order to know this, it is necessary to have some instrument for so testing. The principles embodied in an instrument of this type should be to test a known motion against the unknown motion produced by the mating gears, and the variation of the gears should be automatically recorded on a paper chart. If the tooth curves are correct and spacing is correct, gears should run with uniform angular velocity but, if the tooth curves are not correct, this instrument would show a variation in motion or, if the spacing of the teeth is not uniform it will also show a variation in motion.

13. *Thread Inspection.* Go and No Go plug and ring gages of proven dimensions, the "three-wire method" for pitch diameter or the projection method for pitch diameter, outside diameter, lead, angle and form should

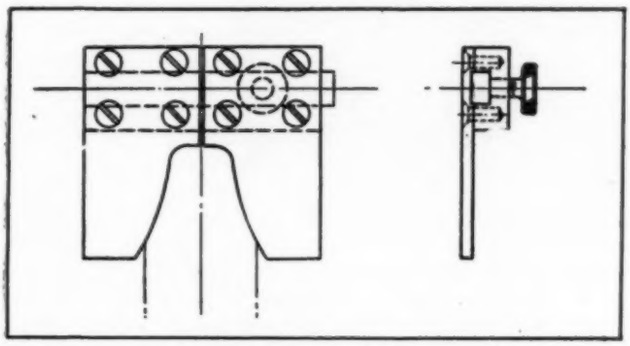


Fig. 10 — Recommended adjustable templet for gaging milling-type form cutters

be used. All plug gages and taps should be tested by the projection method.

14. *External Threads.* If shown to be of proper diameter by use of the "three-wire measurement" and at the same time is a good fit in a ring gage, this is proof of the lead, profile and pitch diameter are correct.

On threads coarser than 12 per inch, good results can be obtained by the use of Prussian blue to prove up the bearing of the thread by the ring gage; if it is a good hand fit and shows a good bearing surface, it is proof the lead, angle, and diameter are correct.

15. *Internal Threads.* Internal threads that are tapped may be inspected by the Go and No Go plug gage, but the tap should first be inspected by the projection method to insure correct lead, profile, and diameter. After an internal thread is smooth enough to show a good Prussian blue spotting off the plug gage, a half section can be cut away and the plug rolled into the remaining half section to show if the lead and angle are correct.

16. *Worm Inspection.* The lead should be tested by attaching the worm to the end of a master screw having the same lead as the worm to be tested and rotating the screw so as to travel the worm past a fixed indicator bearing against the profile of the thread.

The pressure angle of worms having rack-type threads should be tested by inclining the worm from a vertical line the exact amount of the pressure angle and sliding an indicator on a horizontal line with its working point on the profile of the tooth. Worms having curved thread profiles should be tested for tooth form by running them at right angles to and with a master wormwheel and noting the bearing by the use of Prussian blue or some similar agent.

On single jobs or where small quantities are involved it should only be necessary that the worm bear properly with its mating gear unless special accuracy is specified.

II. Hob Inspection

17. *Testing Holes.* Go and No Go plug gages are recommended for this purpose.

18. *Testing Keyways.* Go and No Go plug gages with a key inserted are recommended for this purpose as the size of the keyway and alignment—in relation to the hole—can best be tested by this means.

19. *Concentricity.* Hubs, teeth, squareness of end of hub can be best tested in ordinary bench centers with a dial indicator.

20. *Gash Testing.* Whether a gash is radial or not can best be tested on bench centers with a plug that carries a finger that can be inserted into the gash of the hob and a sight reading taken. On straight gashed hobs, it is necessary to test the parallelism of the gash with the axis of the hob and this can be readily done by mounting the hob on bench centers and passing an indicator along the gash.

On spiral-gashed hobs, it is necessary to know whether the spiral of the gash is correct or not, and this can be tested either with the use of a form that has the correct spiral or with a special machine made with a taper attachment that will impart the necessary spiral rotation.

21. *Tooth Dimensions. Thickness and Depth.* The ordinary gear tooth calipers are best adapted for measuring the thickness of all types of hob teeth. Where topping hobs or worm hobs are to be measured, the ordinary depth micrometer is recommended for measuring depth of tooth.

22. *Tooth Form. Spur, Worm, Spline and Sprocket Hobs.* To measure the contour of hob teeth correctly, an instrument for this purpose is to be recommended. The hob should be mounted on a mandrel and a contact finger connected with an indicator should be passed along the contour of the hob tooth. Any variations in the contour will be shown on the indicator dial. Charts can be made of the theoretically exact contour desired and hob teeth can then be checked against these charts.

23. *Lead.* The hob should be tested for lead, that is to see whether all the cutting edges fall in the true helical path. A simple instrument is to be recommended in

which a master screw with the same lead as the hob, is used. The hob is mounted on the arbor end of this screw and as both are rotated at the same time an indicator can be used to detect the variation in the cutting edges. In this test, charts should be plotted and records kept of the actual condition of the hob.

III. Inspection of Gear Cutters (Shaper)

24. *Hardness.* This may be tested by any of the standard hardness testing instruments and by means of a file.

25. *Bore.* Check diameter and roundness by use of plug or micrometer gages.

26. *Flatness of Back Surface.* Check back surface of cutter on a surface plate.

27. *Parallelism of Sides.* Pass cutter sides circularly on a face plate under dial indicator or check by micrometer.

28. *Angle and Concentricity of Front Cutting Surface.* Place cutter on fixture such as is shown in Fig. 9; apply bluing to lower angle of gage *A* and revolve same (guided by stud arbor *B*) on front angle of cutter.

29. *Clearance Angle.* With cutter in place on fixture (Fig. 9), use angle gage *C* as shown.

30. *Concentricity and Tooth Spacing.* Mount cutter on stud arbor *B* (Fig. 9), bringing face of one tooth against the positive permanent stop *D*, while the next corresponding tooth face is in contact with the point *E* of multiplying lever *F*, engaged against the dial indicator *G* (readings preferably to be in ten-thousandths of an inch), set at zero for first tooth reading; move cutter, advancing contact points to the succeeding tooth faces, noting any variations on indicator. Thus proceed around cutter.

31. *Alternate Method.* Use projecting lantern.

32. *Tooth Thickness.* May be checked by tooth verniers. Care should be taken to make the necessary chordal and perpendicular allowances in making this check. (See any standard table on gears or gear cutters.)

33. *Alternate Method.* Use projecting lantern.

34. *Tooth Form.* By the use of a projecting lantern, compare the tooth form with either a theoretically constructed form or with a predetermined form constructed from a proven satisfactory cutter; select a magnification sufficient to insure the desired accuracy and keep the form being tested near center of lens.

IV. The Inspection of Gear Cutters (Disk)

35. *Hardness.* This may be tested by any of the standard hardness testing instruments and a file.

36. *Bore.* Check diameter and roundness by use of plug (Fig. 1, A. G. M. A. Recommended Practice, Revised April 20, 1922), or micrometer gages. Check keyway size and alignment by use of plug. (Fig. 5, A. G. M. A. Recommended Practice, Revised April 20, 1922).

37. *Wobble.* Check sides for running true, also form of cutter for wobble. Use standard centers with indicator attached, having cutter mounted on suitable shoulder arbor.

38. *Concentricity and Radial Sharpening.* This may be checked on standard testing fixtures especially built for this purpose. Cutter to be rotated against indicator for concentricity and the radial accuracy tested by using finger on the fixture provided for this purpose.

39. *Form Central.* Single Finishing Cutters. This may be checked on standard centers with indicator. Cutter is mounted on shoulder arbor and indicator reading taken. Cutter is then reversed on arbor and should show same indicator reading.

40. *Tooth Form Thickness.* This may be checked with standard tooth calipers. Care should be taken to make the necessary chordal and perpendicular allowances in making this check. See any standard table on gears or gear cutters. If cutters have hooked teeth or are made with side clearance on form, special allowance (which will be furnished by cutter manufacturer) must be made when using tooth calipers.

41. *Tooth Form, Lantern Method.* By use of a projecting lantern compare the tooth form with a predetermined form constructed from a proven satisfactory cutter. Select a magnification sufficient to insure the desired accuracy and keep the form being tested near center of lens.

42. *Tooth Form, Gage Method.* By the use of adjustable templets, Fig. 10, from No. 1 to No. 8, having the correct form for each range of teeth. Templets to be adjustable in parallel plane to take care of variations in width of form (see Fig. 10).

Water Legs on Air Piping

By H. C. Charles

LIQUID in air lines is a matter of concern to the maintenance department. Every one is familiar with the manner in which water and oil enters the high pressure air system. The water, of course, comes from moisture condensing upon cooling in the pipe lines, and the oil comes from the lubricant used in the compressors. The logical place to remove this condensate is near the compressors by means of receivers which are merely high tanks of considerable capacity in which the air is allowed to cool before passing into the distribution pipes, and from which the condensate may be drawn off. However, such tanks are a disadvantage because they cool the air, while the highest efficiency is obtained when using the air at high temperature. Therefore it is good practice to pipe the air direct from the compressor to the points of consumption as long as the consumption is at a fairly steady rate and the pipe lines are of sufficient size to themselves form the necessary air cushion for the compressors to work against.

This latter practice, however, results in the water and oil going directly into the pipe lines, and finally to the air consuming tools; therefore, ample receivers or rather separators must be incorporated in the lines. Even with the separator in the lines some condensate carries over with the air, but since the liquid is heavier than air it is easily thrown out of suspension. In all dead end pipes it is good practice to place a water leg at the end of the line, so that the liquid will pass on toward the end and then settle into the leg where it can be drawn out by periodic visits of some workman delegated for the purpose. Doing this will pay for itself in improved service and longer tool life.

Grinding Operations in Railroad Shops

By Fred H. Colvin
Editor, American Machinist

Some of the more general operations now being performed by grinding, the results secured, and its advantages over other methods

THE growth of the use of grinding as a machining operation in the railroad shop has been somewhat spasmodic. On certain classes of work, such as crosshead guide bars, the side or face grinder was received with but little opposition and this is now the standard method of finishing these parts. The old prejudice against the curved marks left by the grinding wheel has disappeared and there is now hardly a railroad shop without this type of machine. On roads where grinding is given a chance we will also find that the face grinder is used on truck pedestal jaws. These castings frequently have hard spots that seriously affect the cutting tool when a planer or shaper is used, and one road reports a saving of 5 to 1 on this job. Spring saddles are also ground on this railroad, and are finished about 75 per cent faster than with the cutting tool. Piston rod and valve stem grinding is standard in some shops and unknown in others, but grinders for this type of work probably rank next to the face grinding machines in number. The introduction of radial valve gears with their numerous pins and bushings stimulated the use of both internal and cylindrical grinding machines in the small or medium sizes, until these are also fairly common at present. Grinding is, in fact, almost necessary where mating parts are hardened as in valve motion pins and bushings. Distortion is apparently inevitable, and to a greater degree than most users consider permissible for bearings, and grinding permits the desired fits to be obtained after hardening. Good practice means ground pins and bushings.

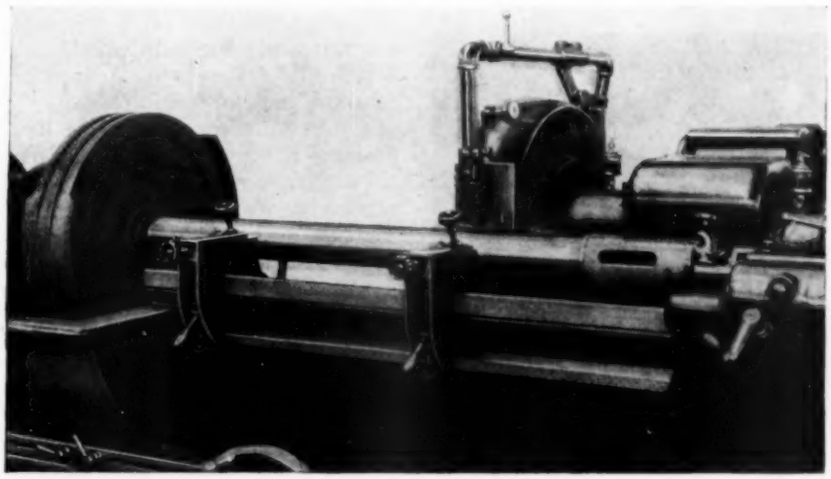


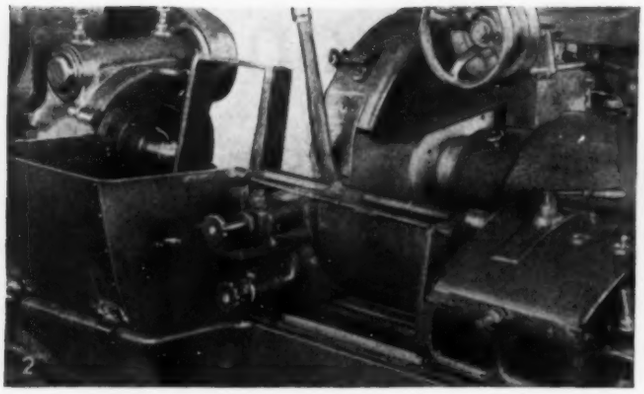
Fig. 1—Grinding a piston rod with the piston in place. The gap in the bed will take a piston 40 in. in diam., and a rod 120 in. long can be swung between centers

Crankpins, crosshead pins and axles are being ground in some railroad shops but the tradition as to the superiority of the rolled or burnished bearing surface still has a firm grip on the minds of many shop men. Burnishing or rolling supplanted the old file and emery cloth finish of long ago and was an improvement in every way. Its success, however, depends largely on the condition of the surface before rolling and also the uniform density of the metal to be rolled. Both of these conditions affect the roundness of the pin or axle after rolling. In fact, it is generally admitted that rolling rarely leaves a round surface. Its great appeal has been in the idea that the rolling process compressed the skin of the metal so as to give a very dense surface that had a longer life than the soft pin. Whatever advantage this may have had with the soft steel pin it has generally disappeared with the growing use of alloy steels in locomotive construction. In shops where the grinding machine is in regular use there is no question as to the superiority of the ground surface over any other method of finish.

Piston rods are ground either before or after mounting in the piston. New rods are usually ground without the piston in place, but when a locomotive comes in for repairs, the modern grinding machine handles the old rod with the piston head in place as in Fig. 1. This shows a Norton machine that will swing 40 in. in the gap left for the piston. In practice, from 0.015 to 0.060 in. of material has to be ground off to true up a worn rod, this requiring from 20 to 35 min. according to the material. The usual tolerances are 0.0005 in. for roundness and 0.002 in. for straightness, an accuracy that cannot be secured in any other known way.

Another job for the piston rod grinding machine is shown in Fig. 2, where the gap in the bed of a Landis hydraulic feed machine is used to swing the yoke on the end of a valve stem for a D-slide valve locomotive. In this particular case the stem is 18 in. long, $1\frac{1}{8}$ in. in

The first part of the article. The conclusion will appear in an early issue.



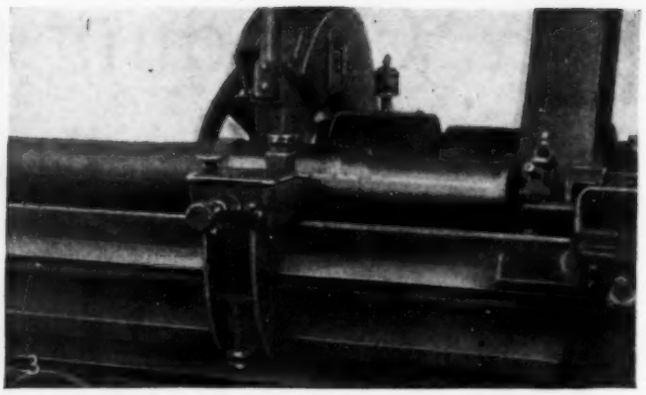


Fig. 2—Another make of piston rod grinder in which the gap is being used to swing the yoke that goes over a D-slide valve. The valve stem is being ground instead of a piston rod. Fig. 3—Grinding car axles on both the journal and wheel fit. A ground finish is found to give longer-lived bearings, to insure a more uniform wheel fit, and to permit removal and replacement without destroying the fit of the axle in the wheel

diam. and required the removal of 0.040 in. to true it up. The job took 25 minutes.

Car axle grinding is seen in Fig. 3, the seat for the wheel being the operation in progress. While comparatively few shops have as yet adopted grinding for this work, the officials in the shops where this has been done are enthusiastic over the results. The average time for 5½-in. bearings and 7-in. wheel seats on standard axles

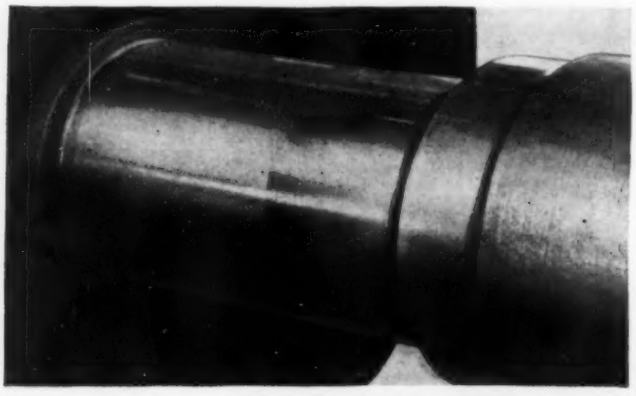


Fig. 4—Rolled axle journal with a light grinding cut over it to show inequalities produced by rolling. While most of the surface has cleaned up, the low spot shows that the journal was not true

is given as 40 min. for both wheel fits and journal bearings. Approximately $\frac{1}{32}$ in. on the diam., or half this on each side, is removed.

The quality of the work, as compared with rolling or burnishing, may be judged from Fig. 4, which shows an axle journal that was first turned and rolled in the usual manner. Then, in order to test its accuracy, the axle was put in the grinding machine and a light cut taken with a grinding wheel. The illustration is from a photograph made after the diameter had been reduced 0.005 in. showing how much out-of-round the journal was after rolling or burnishing.

The other journal was next ground so as to remove all the roller marks and then tested for hardness. While not quite as hard as the burnished surface before grinding the difference was slight and there was the advantage of greater uniformity in hardness over its entire surface. One large rapid transit railroad reports a reduction in cost of 25 per cent due to grinding, in addition to a longer life of the bearings.

Advocates of grinding are particularly enthusiastic over its advantages in finishing wheel fits. Its greater accuracy, as compared with any other method, enables the desired mounting pressures to be secured within very close limits, and with certainty. The straightness and roundness of the ground fit is so far ahead of a turned job that results are better in every way, both in mounting and removing wheels.

Locomotive axles are also ground as advantageously as car axles, on some railroads. Fig. 5 shows journals being finished in a Landis piston rod grinding machine. The wheel fit has not been finished.

On locomotives that use the link valve motion or have eccentrics, the seats for the eccentrics are also ground. One railroad reports that due to the thrust and pound on the eccentrics many axles develop a crack around the keyway, even a file mark helping to start a crack in such places. It is the practice of this railroad to leave $\frac{1}{32}$ in. for grinding so as to be sure and remove all tool marks. This apparently leaves no place for a crack to start, because since this practice was started over two years ago, no cracks have been found in the axles. New, heavy grinding machines have been developed that compete with the lathe in time, in addition to leaving a ground finish.

The same railroad finishes crankpins on the grinding machine. As with the axles previously mentioned, $\frac{1}{32}$ in. is left for grinding, both the rod fit and wheel fit being ground to size. The rod fits are first ground to microm-

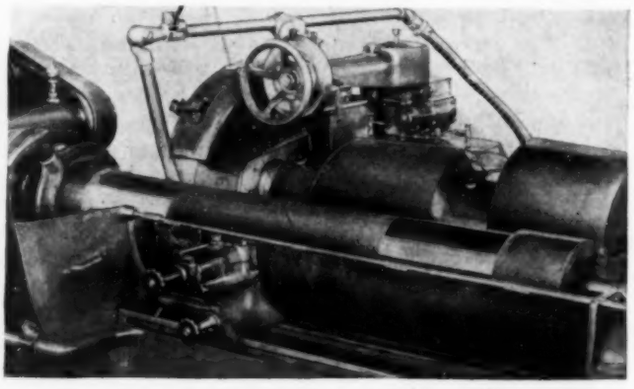


Fig. 5—Grinding a large locomotive axle in a gap-bed machine that can also accommodate pistons on their rods. The wheel fits are also ground before mounting the wheels

eter sizes, then the wheel fit. After the axle is fitted the wheels are "quartered," and then the crank pins are fitted. That ground wheel fits are particularly satisfactory is shown by the fact that after the grinder becomes accustomed to the work, the pressure required to force in the pin rarely varies over 3 to 5 tons from the desired figure.

Large locomotives are hard on crankpins. The thrust is always on the "eights" of a revolution and the pins wear more out-of-round than might be realized. If not trued up accurately they become eccentric and, when dressed up in the old way, lose their original centers and get the engine out of stroke as well as out of "quarter," with a consequent loss of power.

With grinding equipment this difficulty is obviated. When the locomotive comes into the shop after having completed its allotted mileage the pins are pressed out of the driving wheel, the centers cleaned and the pin put in the grinding machine. The amount of wear on the side of the average crankpin is about $\frac{1}{8}$ in., making the rod fit eccentric with the wheel fit. Caliper measurement may show only half this at times, but the eccentricity is still $\frac{1}{8}$ in. in most cases.

With a crankpin having a wheel fit properly ground in the first place, this part of the pin runs true when put in the machine to regrind the rod fit, which is done in about 20 min. on a good machine, Fig. 6. The time taken to press the pin out is 15 min. and an equal amount of time is needed to replace it, making less than an hour for the complete job. The advantage of the ground wheel fit shows up here in the fact that, because of the smooth and uniform surface, the pin can be pressed into the hole again with almost the same fit as before. The average loss in pressure is seldom over 5 tons. Since the wheel fit pressure has a tolerance of 20 tons, the pin remains well within the safe limits. The advantage of this method over that of attempting to true up the crankpin with any of the usual, unstable pin-turning devices, can be seen readily.

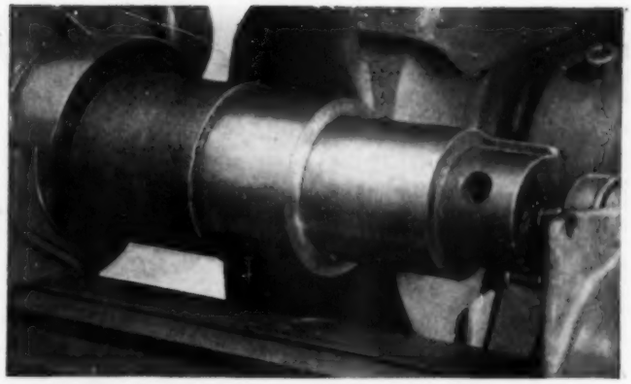


Fig. 6—Worn crankpins are reground between centers to true up the pins, which wear considerably out-of-round on large, heavy-duty engines. The wheel fit, of course, is not reground

Room for Improvement in Manufacturers' Catalogs—*Discussion*

By E. P. Essley
Secretary, The E. L. Essley Machinery Company

I AM inclined to agree with what Mr. Cetrule has to say in the article that appeared on page 483 of this volume of the *American Machinist* under the above title. One of the reasons for the increased cost of selling machine tools is improperly prepared literature. He classes it as the chief reason, and in this I do not agree with him, as I think there are one or two other outstanding reasons for this increased cost. I would not call the catalog matter, in general, poor. I think as a class the printing and art work on the average machine tool catalog are of a high order. Its shortcoming, however, is the lack of thoroughness in its preparation. The product which the manufacturer is attempting to present in the catalog is so well understood by him, and so many things about it perfectly obvious to him that it never occurs to him that many of these things will not be obvious to the purchaser. In preparing literature of this kind, one must really consider that his prospect knows nothing whatever about the machine, and no detail is too small to overlook or describe minutely.

The standard catalog size of the machine tool trade is 11x8½ in. I fully concur with Mr. Cetrule that it would be an excellent thing if the manufacturers would adhere to this size, and I think the loose leaf form is a very good one for binding. Many dealers desire to assemble these catalog sheets into one large album. When the sizes are different, even though they are supposed to be the standard size, it does not make a workman-like book. I think this standardization should also extend into the matter of photograph albums, of which most manufacturers have a great many in circulation. There is absolutely no standardization of the photograph album at this time, in fact, no semblance of one. I believe they should be standardized into an 11x8½-in. size, and there is no reason why the same binder could not be used that is now being installed for the standard price sheets, which are now being put into effect.

From the dealers' angle, I would like to see the manufacturers pay some attention to the weight of the paper upon which catalogs and bulletins are printed. When the general-line dealer gets his album together it makes a heavy, bulky book, and some size and weight could be saved if the manufacturer did not insist upon printing his catalogs on a heavy sheet. I do not mean, of course, to select a paper that will cause the art and press work to suffer, but I am sure at the present time there is no thought given to this particular problem of the dealer when new literature is ordered.

Centralized Records for Efficient Tool Control—*Erratum*

IN THE first installment of the series of articles entitled, "Centralized Records for Efficient Tool Control," by N. J. Bowne and N. Holve, beginning on page 419, Vol. 70, of the *American Machinist*, there is a discussion of the reasons for adopting the six-digit system of numbering tools. One of the principal reasons for deciding on six digits lay in the fact that the plant of the DeLaval Separator Company, with which the authors are connected, operates on the metric system. This statement was inadvertently omitted when the manuscript was prepared for publication.

Automatic Heat-Treating

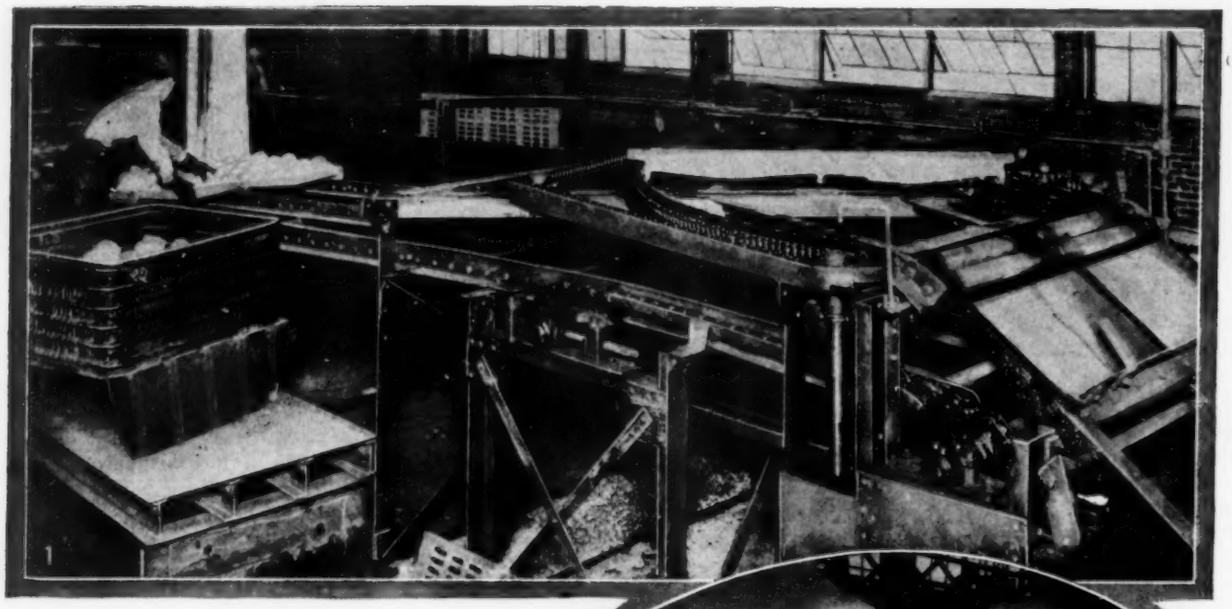
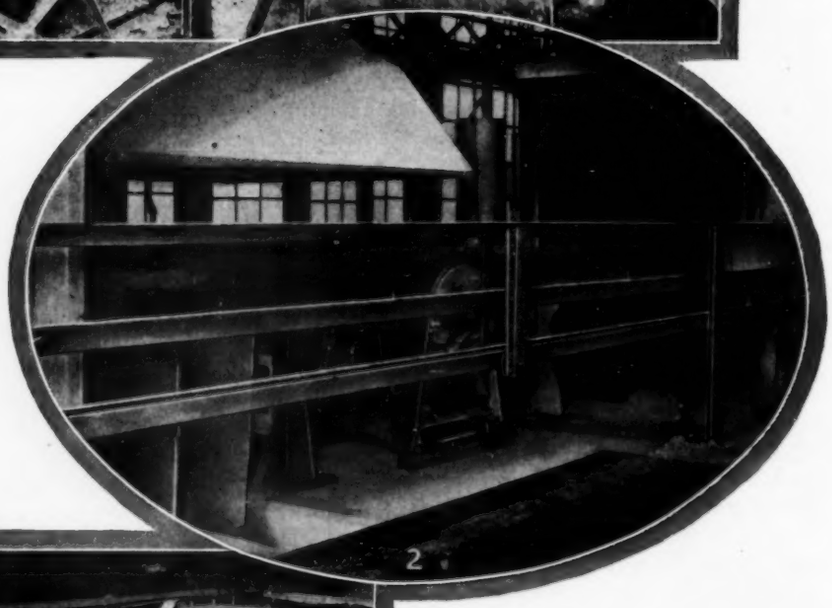


Fig. 1—Charging end of normalizing furnace showing returning trays and conveyor which turns them and drops them to the gravity conveyor that takes them to the charging table



Photographs by courtesy of Surface Combustion Company and Packard Motor Car Company

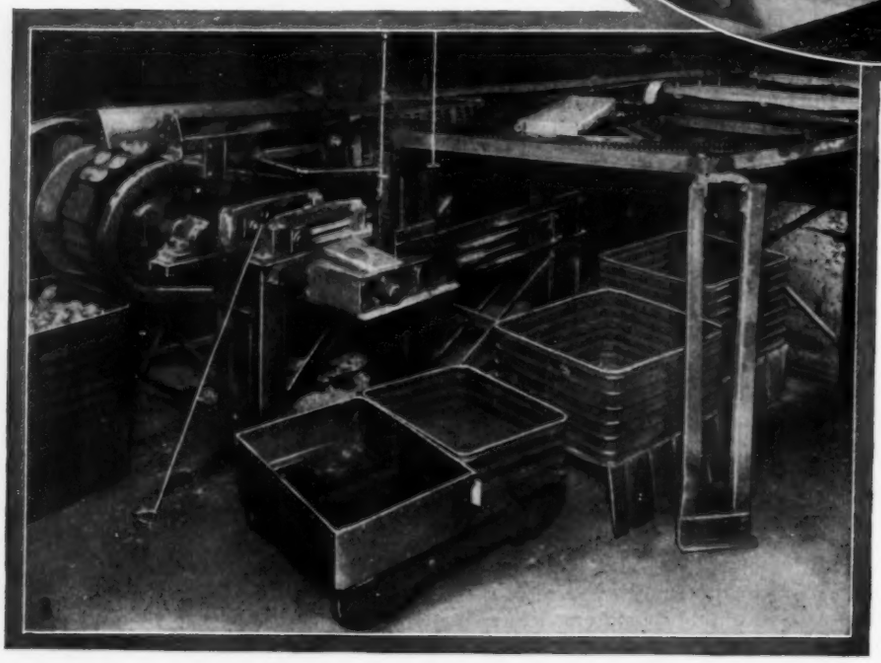


Fig. 2—Discharge end of normalizing furnace with chute to cooling conveyor at extreme left. This conveyor runs under the floor and comes up at the right as in Fig. 6

Fig. 3—Discharge end of drawing furnace showing dumping mechanism and conveyor for returning trays in a vertical position. The work is carried on belt conveyor to bin at the left

Methods in the Packard Plant

THIS heat-treating unit consists of three large furnaces and a quench tank that can be adapted for almost any work. It can normalize heat, quench and draw continuously. The time cycle can be changed for work of different sizes. Gas and oil burners are used, the heat passing toward the charging end to help preheat incoming work.

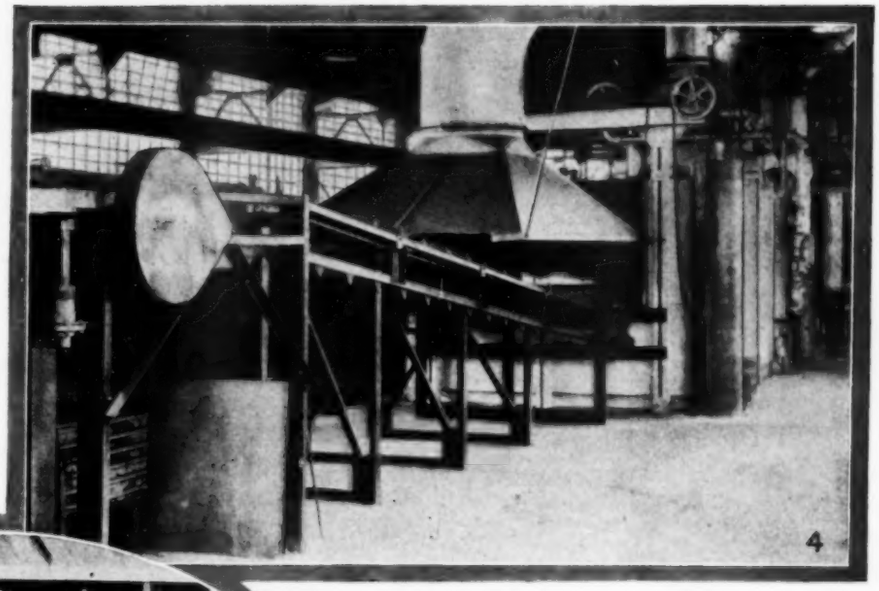


Fig. 4—Outlet end of drawing furnace showing how the chain hooks catch the trunnions on the trays as they leave the furnace. The large hood catches much of the waste heat and conducts it away from the men

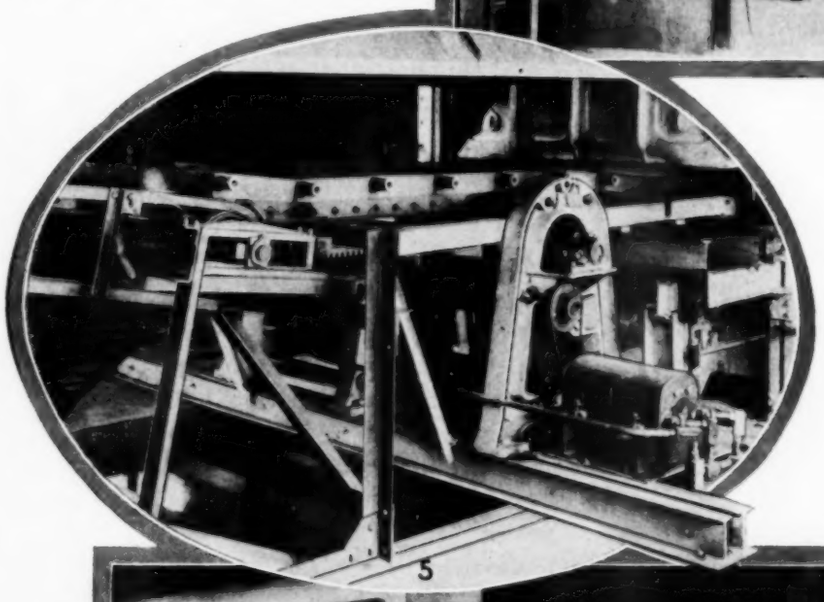
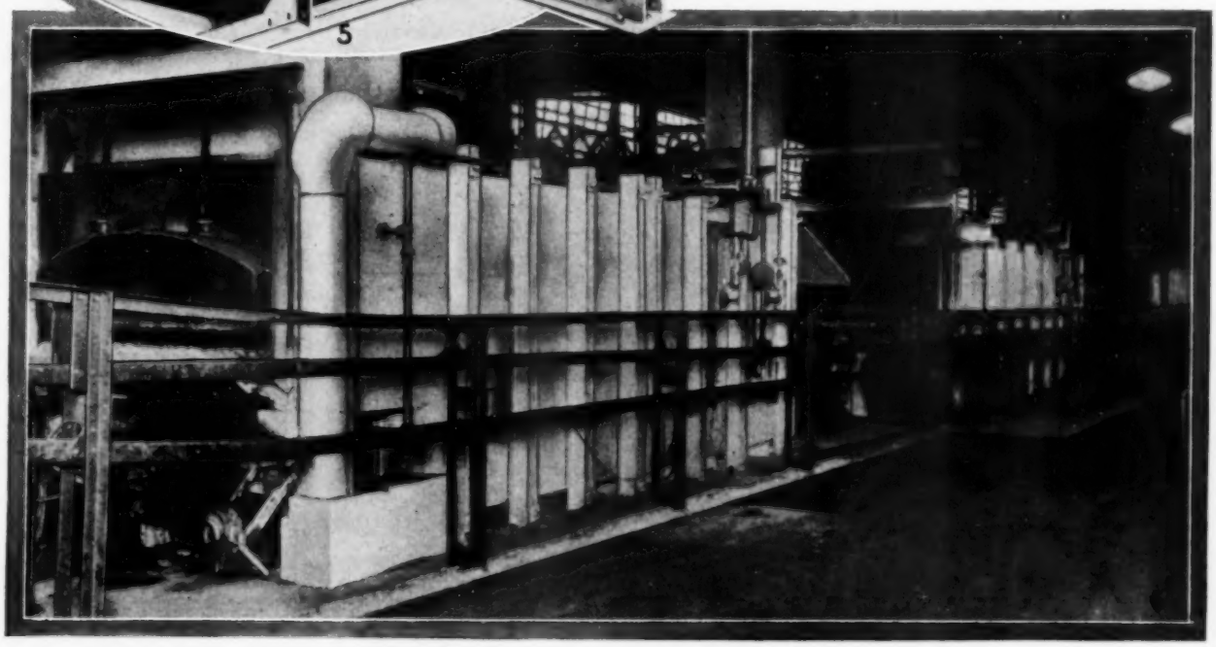


Fig. 5—Discharge end of hardening furnace with quench tank below the conveyor. The trunnions on the trays support them when they leave the supporting rails, while they dump the hot work into the tank

Fig. 6—View of entire installation from charging end of normalizing furnace. The first furnace is 22 ft. long, each of the others is 25 ft. Temperatures and time in furnace are controlled automatically and two men handle the whole equipment



· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Keeping Posted on New Tools

"FUSSING with circulars again I see, Al," said Ed on the way home. "I can't see why you bother about things that don't come into the day's work. I have troubles enough as it is, without lugging them home. What is it now?"

"Circulars about these new cutting alloys, Ed. They read almost like a fairy tale. Think of tools almost as hard as a diamond that stand up hour after hour when the best steels lose an edge!"

"Probably they are fairy stories, Al. More of that five hundred dollar a pound stuff, eh? You said you'd asked Williams for some of the stuff, didn't you? Well why worry about it any more? You'll have enough of that to do when you get it."

"You must feel grouchy tonight, Ed. I'm not worrying about the new tools, but I do want to get posted on them before they get here. The more I know about the new tools the better work we can get out of them."

"Don't seem to me that's our job, Al. We are paid to boss the men and hustle the work along. It's Williams' job to tell us all we need to know about new things he wants us to try. That's why he gets so much more than we do."

"I don't look at it quite that way, Ed. Of course, Williams is supposed to know a lot more than we do—that's why he's the Super. And if we just want to hold our jobs and no more, it may be O.K. to wait for Williams to tell us just what to do. Personally, I prefer to be posted ahead of time. I don't want to have those new tools fall down in my department on account of my not knowing about their peculiarities. Besides, I enjoy learning about new things in the industry."

"Well, I'd rather read the sport columns, Al. I get fed up on blueprints and the like during the day. And won't the new tools have full directions with them when they come?"

"Probably. But I'd rather not wait. Besides, I get a real kick out of knowing the inside dope on new things. Take grinding the tools, for example. They are so darned hard that they need special wheels, and want to be handled right. It wouldn't be any joke to crack a fifty dollar tool just because you put water on it when it should be ground dry."

"I'm not sure but it's better to put all your attention on the things you have in hand, Al, and not cross those bridges till you come to them. No use borrowing trouble, you know. It comes fast enough anyhow."

"Yes, Ed, and why? Because something happens that we never heard of? Then Williams will come along and tell us what to do, because he has read about it ahead of time and remembers what he reads."

Is Al right in trying to get posted ahead of time? Or is it better to give all of your attention to present problems? Should the foremen depend on the Super for his information?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Shall Men Clean Their Own Machines?

THE article under the title given above reminds me of the way in which machines for making wood screws were cleaned in a shop I knew. The machines were comparatively small, and were mounted on long benches to which they are attached by lag screws. They were taken off of the bench and immersed bodily in hot soda water. When taken out they soon become dry because they retained a great deal of the heat from the hot bath. When dry, they were put back on the bench and the bearings thoroughly oiled, making them ready for immediate service. When the machines were taken off of the bench, they were lifted by a light hoist running on a monorail leading to the cleaning tank.

—MATTHEW HARRIS.

Al Orders an Emergency Pump

THE policy of giving subordinates authority to do things falling within their sphere is being extended more and more. When a man is given a chance to think for himself, he develops a sense of responsibility and faith in himself, which are assets to his company.

In this particular case, the man left in charge of the shop knew that in order to meet his production schedule he must have a machine that would put out the work. Consequently, when the coolant pump on the machine failed to work, there was one of two things for him to decide.

Whether to let the machine lay idle and fall behind on production, or buy a new pump that he knew would work, and meet the guarantee of delivery. He used his own judgment which was sound. Why reprimand or criticize subordinates for using good common sense?

—H. E. BAUGHMAN, *Engineer, Portsmouth By-Product Coke Company.*

Spending Money for Oiling Equipment

TO ELIMINATE all doubt as to proper oiling the following method has been adopted in one factory to keep the machines oiled to the satisfaction of the management. The average small shop usually has a man whose duty it is to cut off material, clean the shop, attend to the heating facilities, and similar work. In this particular shop it is also his duty to oil the machinery. Every morning before starting time he has to oil the grinders, every noon during lunch hour he has to oil part of the shafting and hangers, making a complete cycle in the course of a week. This leaves only the machines to be oiled. Machinists are required to oil their own machines every day, and they do so, usually in the morning. Sixty remaining machines are oiled by means of a schedule. Every machine in the shop has a symbol, such as: Lathes, L-1, L-2, shapers, S-1 S-2, etc., hence the scheduling is an easy matter. Twelve machines are put on an oiling schedule card. On the top of this card is the day on which the twelve respective machines are to be oiled. In the course of five days, Monday to Friday, all of the sixty machines are oiled at least once, besides being occasionally oiled by the workmen. As the machines are oiled a check mark is placed alongside its symbol. At the end of the week the cards are turned over to the foreman for approval and any blank spaces are accounted for. —PETER E. MCMANUS, JR.

THE · NEXT · TOPIC

Picking Men in Cheerful Surroundings

ADVANCE QUESTION

Williams, the super, is fitting up an attractive room in which to interview men for employment. Ed doesn't see that it is at all necessary. Al tells why he thinks it's a good thing.

The Foremen's Ideas on Pensions

A PENSION plan is usually understood to be an incentive for employees to remain with the company. This being the case, it makes it a company proposition to maintain a fund and reap the benefits of a smaller labor turnover.

The plan to have the men contribute to the fund would not work out well. Some would join in the plan, and some not, and of course it could not be compulsory. This would make complications of every description. Take, for example, a case where two men are hired about the same time, one joining the pension plan immediately, and the other not. After several years have elapsed, the latter decides to join, which could not be denied him.

This condition would require some sort of a differential for every conceivable combination, and to me it looks like a very confusing and unsatisfactory plan.

—L. F. SWANSON.

Letting Small Savings Offset Larger Wastes

OF COURSE, if the "efficiency bird" at Bill Thompton's plant did not know what he was doing, he would proceed the way Bill told Ed. If efficiency only means fast running, either of men or machines, the result is likely to be that of spoiling drills which would offset

every cent saved through the higher speed of the drill press. If an experienced man were hired to look after efficiency in Bill's shop, he would at once reduce the speed of the drill press to a point where the drills would not break, until he had investigated, and found the real reason for breaking the drills. This cause may be poor drills, wrong coolant, too weak a drill press, a loose work table, or faultily ground drills. Perhaps the trouble was in the heat-treatment of the piece, or the fixture may be rocking. If this investigation did not disclose the reason, Mr. Efficiency Man should be satisfied with a lower speed which would not break the drills.

—A. E. FRISTEDT, *Sweden.*

More Responsibilities for the Foreman

UNDER the general application of the term, quality, quantity and cost of output are the three greatest responsibilities of a foreman, and as such should command the best attention that a man can give.

Whether this attention, as in the larger shops, must be given through other persons, delegated by the foreman, or, as in the case of the small shop, by a single "boss" covering all functions from checking specifications to reporting shipments is immaterial. The underlying principle is the same. The foreman is the man hired and delegated by the management to run things, and as such it is up to him either to do the necessary things to insure quality and proper cost of product himself, or else see that others, under his supervision, attend to these details.

Such being the case, it would be perfectly proper and in full accord with good shop practice to have first pieces from any set-up checked by the foreman or his representative before proceeding with the run.

—D. C. WRIGHT.

Instructors for Shop Men

HAVING an instructor to teach backward men is a good plan provided the instructor keeps to his own work. The best way to handle this, is for the foreman to put all backward and unsatisfactory men on an instruction list, which should be given to the instructor. These men should still come under the shop foreman in the usual way, but when they start on a new job the instructor should show them how to set it up, how to do it, every cent saved through the higher speed of the drill the work sufficiently often to prevent it being spoiled.

New men started in the shop could, with advantage, be placed under the instructor for a short time, and take a lot of worry from the foreman's shoulders. He would more than save the firm the price of his salary through the better work turned out. —W. E. WARNER, *England.*

WHILE it seems that all machinists ought to know how to do the work right, it is surprising what a large proportion do not. The average man in the shop is bewildered and helpless when he runs into a new problem or difficulty. He lacks a varied experience and not having much vision cannot adapt himself to varied conditions of work. Some are too careless, some too cautious, but the right kind and amount of instruction will improve all of them.

If the plant is large enough a man may be retained for instruction purposes only, and a small shop set up for his use. Such of the men as can be spared from time to time, dependent upon their need of it, should be assigned to the school for instruction along the proper lines. While some will resent being sent to the school for instruction, it should be explained to them that this training is for the purpose of enabling them to do better work, and, incidentally, increase their earning power.

—L. O. BROWN.

Shall a Man Sit Down to Work?

ALL of us should agree with Al's answers to Ed. I, personally, have no rule that men must not sit down on any job which could be done better standing. Common laborers as well as skilled men, are reaching a point where they expect relations with their employer that allow them more leeway than was the case in the old days. The clerks in department stores that used to be required to stand all day behind the counters are now provided with stools and permitted to sit when not actually busy with sales. Also note that motormen are allowed to sit down. The old rules required them to stand eight or nine hours, which is a long stretch to ask anyone to stand, it seems to me.

—CHARLES H. WILLEY, *Ass't Plant Sup't.*

A MAN can do many jobs just as efficiently sitting as standing. Therefore a rule that compels a man to stand all day, means that his vitality is often unnecessarily weakened.

The machining of large pieces on the lathe, boring-mill, milling machine, and planer, is a good example. After the piece is located and the tool starts to cut the operator can watch his machine just as well sitting as standing.

Whether a man should be "bawled out" before a stranger depends on the man. In most cases a private reprimand will have a better reaction than a public "bawling out" would.

E. THORNTON PACKHAM, *Tool Designer.*

The Exit Interview

BARRING the exit of floaters and those who are dismissed for cause, the exit interview is likely to point out defects in management and working conditions which otherwise would go undiscovered.

The resentment of the foreman toward the exit interview is natural. The position of a foreman is not happy. His responsibilities are many, the equipment at his disposal is not always what it should be, and if work is spoiled or is not finished on time, it is he who is held responsible. On top of all his other tribulations is added the exit interview.

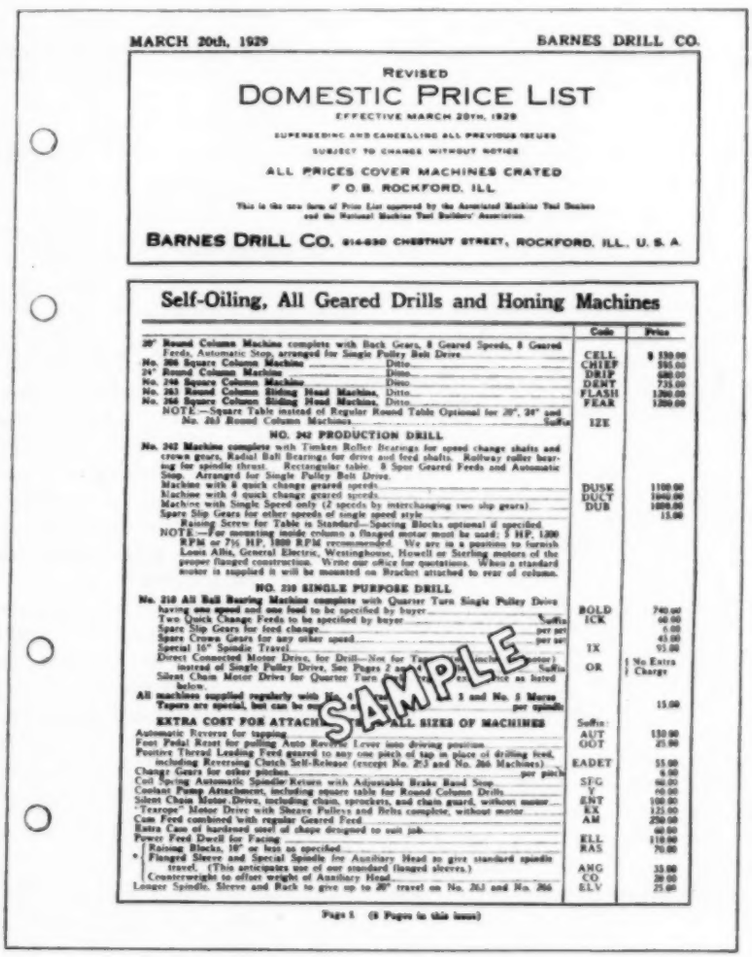
I presume that complaints against the foreman or management would be in the minority. It is the physical aspect of the plant which would receive the largest share, such as: The shop is too untidy, provision for hanging clothes is out of date; cold water to wash up with; too much time lost exchanging tools at toolcrib; poor ventilation, and numberless petty complaints which can easily be corrected, but which will probably go unnoticed unless brought out in the exit interview. —WM. SCHIRMER.

A Standard Price Sheet for Machine Tools

Uniformity in size of sheet, thickness of stock, and position of punched holes assure a neat binder for the dealer

DEALERS handling a line of machine tools or other machinery have always been up against the difficulty of assembling the literature of the products they sell in a neat array and with as little bulk as possible. In order to aid them, the manufacturers agreed some time ago to standardize on the 8½x11-in. catalog size, and gradually some degree of conformance is being attained. Now, through a co-operative arrangement between the Associated Machine Tool Dealers and the National Machine Tool Builders' Association, a new price book and price sheet standard has been adopted and will be put into effect by June 1. These sheets will also be 8½x11 in. The manufacturer is expected to print his price lists on these standard sheets, and the dealer in turn will be expected to provide his own special standard binders to contain them. In order to assure absolute uniformity, the paper for the price sheets and the binders are being issued through the dealers association at the headquarters of the secretary, E. P. Essley, of the E. L. Essley Machinery Company, 551 West Washington Boulevard, Chicago. Furthermore, it is suggested that all dealers and manufacturers, whether they be members of either of the associations mentioned or not, purchase and use these standard forms. The binders are available in five sizes, both flexible and stiff back. All are identical in design and texture of leather. Either flexible or stiff backs may be used. It is suggested that inside men who wish to keep their books in a standing position select the stiff back, as the flexible cover would get out of shape when so used. For the salesmen on the road, the flexible back may be preferable, as it does not bulk quite as much as the other. Other special features have been built into the details of these binders to make for greater ease of operation and durability, as well as good appearance.

Every sheet that is intended to go in these new price books must be printed on standard paper, obtainable through the dealers' association. This paper is available in white, green, buff, pink, and gray, and will be supplied in standard, unbroken ream packages. It is carefully trimmed and punched to certain fixed dimensions and put over checking gages to insure that all standards are maintained. Abridged 16-position indexes are also furnished. A sample of a typical price sheet is shown in Fig. 1. The maximum type page permitted is 6⅝x10⅛ in., and the placing of this page on the front sheet is ⅜ in. from the top and right side, ½ in. from the bottom, and 1½ in. from the left side. Smaller type pages may be used, but the most important consideration is not to print any closer than 1½ in. from the binding edge. Sheets should be printed so that all will gather with the natural roll of the sheet away from the person. Each page is to be numbered and is to show the number of pages in the set, as "Page 1 (6 pages in this issue)." The date of issue is also to be repeated on each sheet, as should the dealer's name, in order that the price sheet may be identified in case of separation from the balance of the set. The manufacturer's name is on the first line on each



MARCH 20th, 1929 — BARNES DRILL CO.

REVISED

DOMESTIC PRICE LIST

EFFECTIVE MARCH 20th, 1929

SUPERSEDING AND CANCELLING ALL PREVIOUS ISSUES

SUBJECT TO CHANGE WITHOUT NOTICE

ALL PRICES COVER MACHINES CRATED

F. O. B. ROCKFORD, ILL.

This is the new form of Price List approved by the Associated Machine Tool Dealers and the National Machine Tool Builders' Association.

BARNES DRILL CO. 814-830 CHESTNUT STREET, ROCKFORD, ILL., U. S. A.

Self-Oiling, All Geared Drills and Honing Machines

	Code	Price
20" Round Column Machine complete with Back Gears, 8 Geared Speeds, 8 Geared Feeds, Automatic Stop, arranged for Single Pulley Belt Drive	CELL	$ 530.00
No. 206 Square Column Machine — Ditto	CHIEF	595.00
24" Round Column Machine — Ditto	DRIP	660.00
No. 246 Square Column Machine — Ditto	DENT	735.00
No. 263 Square Column Sliding Head Machine, Ditto	FLASH	1260.00
No. 266 Square Column Sliding Head Machine, Ditto	FEAR	1260.00
NOTE—Square Table instead of Regular Round Table Optional for 20", 24" and No. 263 Round Column Machines	Suffix 12E	
NO. 242 PRODUCTION DRILL		
No. 242 Machine complete with Timken Roller Bearings for speed change shafts and crown gears, Radial Ball Bearings for drive and feed shafts. Railway roller bearing for spindle thrust. Rectangular table. 8 Spur Geared Feeds and Automatic Stop. Arranged for Single Pulley Belt Drive.		
Machine with 6 quick change geared speeds	DUSE	1100.00
Machine with 4 quick change geared speeds	DUCT	1046.00
Machine with Single Speed only (2 speeds by interchanging two slip gears)	DUB	1056.00
Spare Slip Gears for other speeds of single speed style		15.00
Raising Screw for Table is Standard—Spacing Blocks optional if specified.		
NOTE—For mounting inside column a flanged motor must be used: 5 HP, 1200 RPM or 7½ HP, 1800 RPM recommended. We are in a position to furnish Louis Allis, General Electric, Westinghouse, Howell or Sterling motors of the proper flanged construction. Write our office for quotations. When a standard motor is supplied it will be mounted on Bracket attached to rear of column.		
NO. 210 SINGLE PURPOSE DRILL		
No. 210 All Ball Bearing Machine complete with Quarter Turn Single Pulley Drive having one speed and one feed to be specified by buyer	BOLD	740.00
Two Quick Change Feeds to be specified by buyer	Suffix ICK	60.00
Spare Slip Gears for feed changes	per pair	15.00
Spare Crown Gears for any other speed	per pair	45.00
Special 16" Spindle Travel	IX	95.00
Direct Connected Motor Drive, for Drill—Not for Tapping (Motor instead of Single Pulley Drive. See Pages 2 and 3)	OR	No Extra Charge
Silent Chain Motor Drive for Quarter Turn Drive as listed below.		
All machines supplied regularly with No. 2 and No. 3 Morse Tapers are special, but can be supplied	per spindle	15.00
EXTRA COST FOR ATTACHMENTS FOR ALL SIZES OF MACHINES		
Automatic Reverse for tapping	Suffix AUT	130.00
Foot Pedal Reset for pulling Auto Reverse Lever into driving position	GOT	25.00
Positive Thread Leading Feed geared to any one pitch of tap in place of drilling feed, including Reversing Clutch Self-Release (except No. 263 and No. 266 Machines)	EADET	55.00
Change Gears for other pitches	per pitch	6.00
Coil Spring Automatic Spindle Return with Adjustable Brake Band Stop	SEG	50.00
Coolant Pump Attachment, including square table for Round Column Drills	Y	90.00
Silent Chain Motor Drive, including chain, sprockets, and chain guard, without motor	ENT	100.00
"Texrope" Motor Drive with Shearer Pulleys and Belts complete, without motor	KX	125.00
Cam Feed combined with regular Geared Feed	AM	250.00
Extra Cam of hardened steel of shape designed to suit job		60.00
Power Feed Dwell for Facing	ELL	110.00
Raising Blocks, 10" or less as specified	RAS	70.00
* Flanged Sleeve and Special Spindle for Auxiliary Head to give standard spindle travel. (This anticipates use of our standard flanged sleeves.)	ANG	35.00
Counterweight to offset weight of Auxiliary Head	CO	20.00
Longer Spindle, Sleeve and Rack to give up to 20" travel on No. 263 and No. 266	ELV	25.00

SAMPLE

Page 1 (6 Pages in this issue)

Fig. 1—Sample of standard price sheet approved by the machine tool builders and dealers associations reduced from an 8½x11-in. page

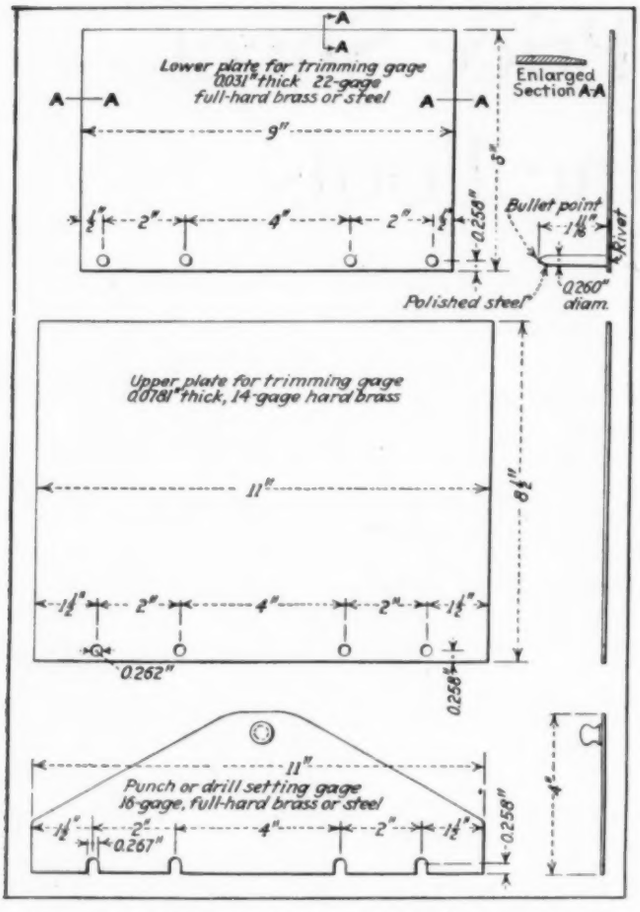


Fig. 2 — Details of a trimming and setting gage for the sheet standardization program of the National Machine Tool Builders Association and the Associated Machine Tool Dealers

page and is placed to the extreme outer margin. On the title page, the street address as well as the city address of the manufacturer is to be included to facilitate delivery of mail and express. When price extensions are made, they are to be carried out with a fine dotted line to avoid transposition of price.

It has been recommended that no unnecessary matter, illustrations or real catalog material be included on these price lists, as it is feared there may be a tendency to expand the amount of data on a large size sheet, duplicating information already contained in the catalog. It is realized, of course, that a composite set of dimensions will be necessary on the price sheet, but it is expected that no further sales data or illustrations will be used. No provision has been made for those concerns that might still wish to use the conventional type of ring binder for the new large sheet, as it is manifestly impossible to design a sheet with universal punchings that will fit every style binder.

The details for making the trimming and setting gages of the standard sheets are shown in Fig. 2. They are intended for the use of manufacturers who may wish to prepare special books for their field men, including standard and special circulars and installation photographs. It is particularly emphasized that the work be done carefully, preferably by a toolmaker, in order to assure satisfactory use of the standard binder. No provision has as yet been made to supply these trimming and setting gages, and it is expected that the manufacturers desiring them will make them themselves.

Where complete price lists include more than one sheet, it is necessary to pack them temporarily together for mailing and storage purposes. The fine wire staple used by the Bostitch stapling machine is most suitable for this purpose. It is not recommended, however, that sets be permanently pasted together, as a price change occurring only on one sheet could be taken care of by reprinting one sheet only. Keeping the sheets all loose in the price book will make this procedure possible.

Some Characteristics of Tin Plate

By A. L. Walker
New Southgate, England

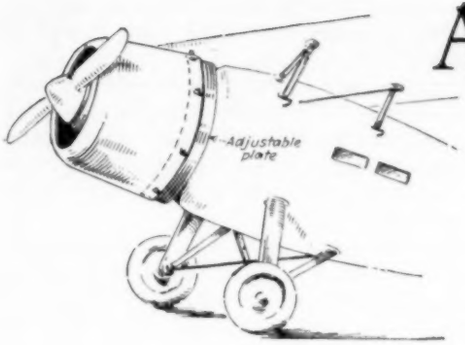
TIN PLATE is one of the most used raw materials of manufacture throughout the world. It is black sheet steel coated with tin. The grading of tin plate is peculiar to the industry, there being, roughly, five grades —cokes, best cokes, common charcoals, charcoals, and best charcoals. These grades are arranged in asecnding order of quality, best charcoals being the best usually obtainable and having a mirror-like surface. The actual names are derived from the old methods of manufacture, but now refer only to the quality of the sheet, especially as regards the surface.

Inequalities in manufacture cause imperfections on a certain percentage of plates. Thus tin plates are classified either as primes, which are perfect sheets, or wasters, which possess some imperfections. Stock sizes may be bought as one, or the other, there being a certain allowance for wasters. When a special size is ordered, the wasters produced with the whole batch are taken with the primes. Generally speaking, the wasters average below 10 per cent.

If tin plate is required for deep stamping, this should be stated on the order. Especially annealed plate is supplied for the purpose, and usually the base plate is of basic steel. Where possible, tin plate should be formed or bent across the grain. If this rule is not adhered to, flats may be produced. Ample pressure should always be applied, since more failures are the result of light loads than of heavy ones. When ordering, it should be stated which way rolling of the plate should take place, if this is of importance in manufacture. Consideration should be given to this point, since it may result in economies in cutting up. A tin plate possesses two different sides. In other words there is a best side.

Recently another grade of tin plate has come on the market. It is termed single-annealed sheet. Annealing is carried out sheet by sheet, and greater drawing powers are imparted. The Erichsen cupping test is not always reliable for tin plate, since the tin acts in the nature of a lubricant, and is not the same in the testing apparatus as in the press tools. In general, press shop results are better than a cupping figure might indicate. Usually the micro-structure of the dome is masked by the tin.

Considerable use is made in foreign trade journals of the word "rationalization." It is defined as the methods of technique and organization of labor, standardization both of materials and of products, simplification of processes, and improvements in the system of transport and marketing. Scientific management is the nearest expression that conveys most of the idea involved.



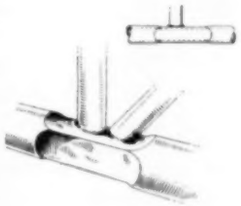
Aeronautical Design

Seen at the Detroit Show

An attempt to simplify designs and mechanism with the idea of high quantity production in mind is noticeable

FROM an engineering standpoint, the second All-American Aircraft Show, held in Detroit during the week of April 1, was particularly valuable in that it afforded an opportunity to study more than one hundred designs as well as the details of a large number of engines and accessories. Such a representation comes as nearly as possible to presenting an accurate picture of the status of aeronautical engineering. Development in aircraft design, like other forms of progress, is a process of evolution. It is always possible, however, when a large number of airplanes are displayed, to note general design tendencies and to visualize the airplane of the future.

A comparison with the first All-American Aircraft Show, held a year ago in the same city, shows a greater proportion of airplanes of proven commercial value. It is interesting to note, however, that several of the designs then regarded as speculative, have taken their place among the accepted types.



Longerons squared at the joints for ease in assembly

An attempt to simplify designs and mechanism with the ultimate idea of high quantity production was observable on one side, and several of the features which in earlier designs were wont to cause production "bottle necks" have been eliminated. On the other hand, there was a number of designs in which aerodynamic efficiency was considered before production possibilities. In almost all of the last-mentioned cases, however, it is probable that production methods will be improved and volume increased to the point where manufacturing costs on high efficient designs will not be prohibitive. The same may be said of engines also.

The importance of aerodynamic cleanness in obtaining increased performance is being realized where, a year ago, engineers would invariably increase power to gain the same end. Many creditable attempts have been made to reduce drag and interference effects on the new models exhibited at Detroit.

One of the most significant steps in this direction is the adaptation of the N.A.C.A. low-drag radial engine cowling to airplanes, and four of these were exhibited at the show. Increases of top speed from 7 to 10 m.p.h. and even greater were reported by the manufacturers whose planes embodied this principle. In most cases the cowling was made in halves, hinged together in such a manner that it could be removed without taking off the propeller. The cowlings exhibited varied widely in interior design. An interesting and useful modification of the cowling was found on the Pitcairn PA-6 biplane. It consists of a telescoped section at the rear arranged to slide longitudinally and change the size of the annular opening between fuselage and cowling. The sliding section may be moved to any desired position and is held in place by several bolts with wing nuts. This arrangement was adapted by the Pitcairn company to provide adequate cooling for warm weather operation.

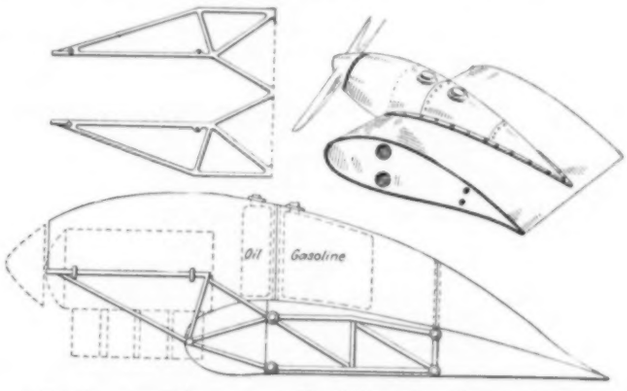
Another efficient cowling installation was found on the "Cabinaire" biplane, exhibited by the Paramount Aircraft Corporation. In appearance this plane is particularly well adapted to the cowling installation. This together with the special finishing process developed by the company, produced one of the most attractive exhibits of the show. The cowling was so blended into the lines of the fuselage that it greatly improved the appearance of the plane and removed the machinery look that so obtrudes itself on the eye in the average radial-engined plane.

Tapered wings are coming into more general use and more originality is being shown in the development and choice of wing sections. Judging from the planes exhibited at Detroit, cantilever wing types are becoming popular and thicker wing sections are being used, providing greater spar depth and structural strength.

Although wood is still the predominating structural material in airplane wings, several of the new planes at the show had metal wing structures and two made use of both steel and aluminum alloy. Another craft utilized fiber in the structure of the wing. Several combination wood and metal wing structures also were employed.

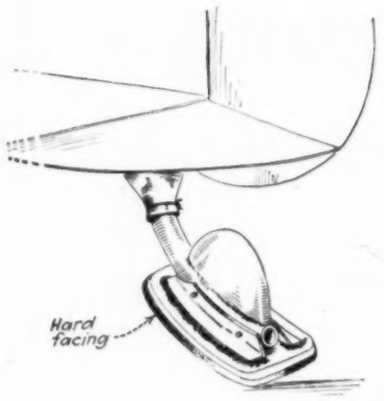
For manufacturers using spruce as structural material in wings, an interesting and efficient arrangement has been worked out by the Posey Manufacturing Company. By this arrangement the Posey company contracts with the airplane manufacturer to furnish complete sets of spars, ribs or both, finished to the specifications of the aircraft manufacturer and ready for assembly.

An interesting metal wing structure was noted in the

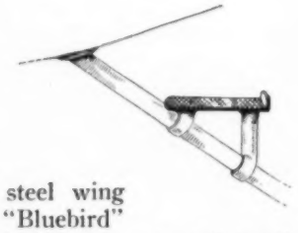


Engine mounting stream lined into the wing surfaces

PT-6 cabin biplane developed and exhibited by the Cunningham-Hall Aircraft Corporation. This plane is one of the type having upper wings mounted flush with the top of fuselage. The wing ribs are of Warren truss type of duralumin tubing, heat-treated, with special riveted joints. The upper wing beams are of one truss type, comprising upper and lower longitudinals of chrome-molybdenum steel tubing, heat-treated to 125,000 lb. per sq.in. The upper longitudinal is reinforced for a considerable distance at the outer support by chrome-molybdenum steel tubing, likewise heat-treated. The longitudinals are spaced by double vertical and diagonal members bolted to the longitudinals. Drag trusses in the planes of both upper and lower longitudinals are used, and the compression struts are heat-treated duralumin tube Warren trusses. Aileron hinges are at compression strut points and ailerons structures are of No. 1625 carbon steel.



An unusual production feature is found in the fuselage construction of this airplane. Longerons are squared at the joints by means of a punch press, thereby avoiding the usual curved bevel joints of the abutting members and greatly facilitating production.



The second example of duralumin and steel wing structure was that of the British Blackburn "Bluebird" biplane which is about to be produced in this country. This construction consists essentially of steel spars and duralumin ribs and fairing. Rivets and bolts are used throughout, and there are no welds in the primary structure. This is also true of the fuselage structure, which is steel tubing with duralumin fairing members.

A duralumin wing structure is embodied in the design of the Barling NB-3 low-wing monoplane. This structure consists mainly of a large duralumin box member. Several planes having stamped aluminum alloy ribs with wooden spars also were exhibited.

Among the interesting new designs seen at Detroit was the Eaglerock "Bullet," developed by the Alexander Aircraft Corporation. It represents a step in the direction of the "flying-wing" type of craft which is now being developed abroad. The wing consists of three units, two panels and a center section. Contrary to conventional practice, most of the important loads are borne by the steel center section of the wing. The fuselage carries engine and tail loads and provides a streamlined housing for the passengers. All-wood box spars and ribs having fiber in shear only are employed in the wing panel structure. A specially derived airfoil section is used and a long elliptical-taper induced drag.

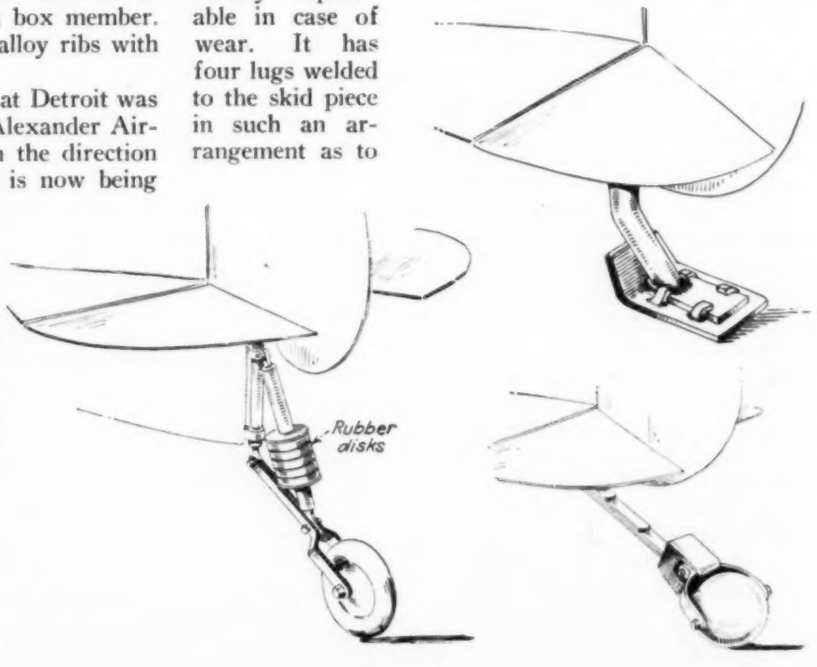
The retractable landing gear mechanism consists essentially of a drum and cables that draw the wheels up into streamlined compartments in the under side of the fuselage. By releasing a trigger the landing gear can be dropped into position, falling by gravity. A handwheel mounted on the front wing beam is used to retract the landing gear.

The tail skid is a five-leaf spring with a readily detachable hardened steel shoe. The entire assembly is pivoted to the fuselage and can be removed easily when necessary. The rudder axis is set in such a position as to be vertical when the plane is taxiing on the ground or in a stall.

Another interesting design which made its first appearance at the Detroit Show was the "Ranger" exhibited by the Mohawk Aircraft Corporation. The Ranger is a three-place, low-wing, cabin monoplane of the full cantilever type. It is powered by two four-cylinder-in-line, air-cooled "Rover" engines mounted in housings streamlined into the upper surfaces of the wing stubs. The wing stub structure is built up of welded steel tubing. The welded steel tube engine mounting is attached to the wing structure by six bolts, and four bolts are employed to mount the inverted engine. Gasoline and oil tanks are located in the streamlined engine housings. Use of other power plants is made possible by the detachable engine mounting.

A type of monoplane wing bracing not customary in this country is used on the center wing plane exhibited by the Invincible Metal Furniture Company. This consists of two external V-struts attached to the lower surface of the wing and connected together by a lateral tie strut beneath the fuselage and behind the landing gear. The system is supported to the fuselage by two streamlined members each connecting one of the lower longerons with one of the fittings used to attach the V-strut to the tie strut.

More attention seems to have been paid to tail landing design than to any other fuselage detail, and a number of interesting constructions were noted. In one case, that of the Lockheed plane, a tailskid is used with a hardened facing for the ground contact member, and a streamline fin welded to the tubular frame. The connection at the fuselage is covered by a bag-like arrangement. Another tailskid is designed so as to be readily replaceable in case of wear. It has four lugs welded to the skid piece in such an arrangement as to

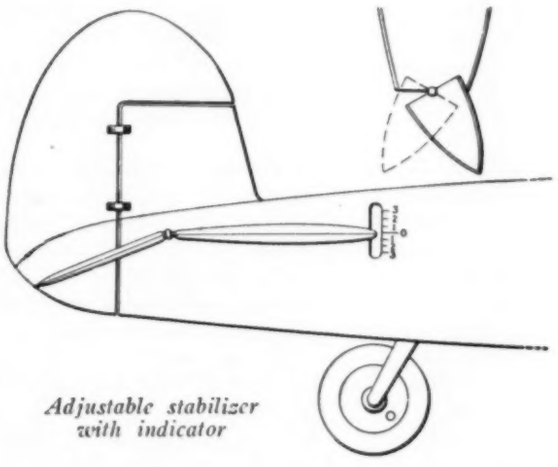


engage and lock with a tapered piece welded to the steel tube projecting from the fuselage. A good example of a pivoted tail wheel was found in the "Aristocrat." It was supported in a forked yoke and had a diagonal shock absorber embodying a series of rubber disks held in place with a laced covering. As a combination of the skid and wheel idea, was a tail skid on the "Cabinaire" employing a spherical steel wheel as the contact member. It was also held in a yoke, which in turn was supported on a cantilever spring, having four leaves.

A combination skid and tail wheel was shown on the Fairchild 71, the skid being of the large broad shoe type with a small steel wheel mounted on the skid shoe in such a way that the plane can be easily rolled about in concrete-floored hangars without the use of a dolly.

Adjustment of the rear stabilizer wings is featured on several plane models, and in more than one instance an indicator is used to register the position in degrees. In the "Knoll" ship, an unusual construction is used to obtain control of the movement of the stabilizer while in flight. It has a 6 in. travel, 4 deg. in either direction. Cables from a hand control in the cockpit wind around a grooved drum mounted on a quill. This quill has right- and left-hand screw threads engaging two screws, one on each side. One screw is fixed in the fuselage, the other is attached to the free end of the stabilizer, which is pivoted at the rear. With this design the center line of the drum rises and falls, but the cable permits this movement to take place without interfering with the control.

Control of the position of the vertical stabilizer is possible in the "Mohawk." A movement of 2 in. in either direction is possible. By means of a hand crank in the cockpit, the control rod with a threaded end, advances and withdraws a threaded sleeve carried at the



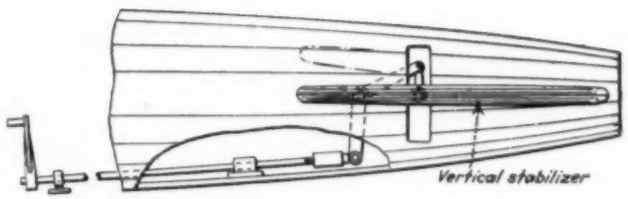
Adjustable stabilizer with indicator

end of a bell crank, the other end of which is connected to the stabilizer by a link member.

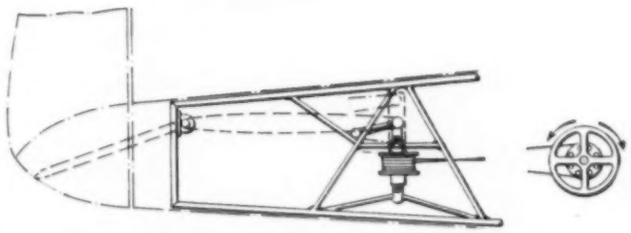
A modification of the monoplane uses a short stub lower wing, not for any additional lifting capacity, but to afford a support for the upper wing brace and the landing gear shock absorber strut. In one instance, that of the "Verville" the space provided inside the stub wing is used as a pocket for tools.

Another chassis or fuselage detail noted was a welded step piece on the streamlined landing gear strut. Two sheet-metal bands encompass the streamline section.

Several original production practices are employed in the manufacture of the biplane exhibited by Fleet Aircraft, Inc., one of the most interesting being the use of



An adjustable vertical stabilizer



Stabilizer control of unique design

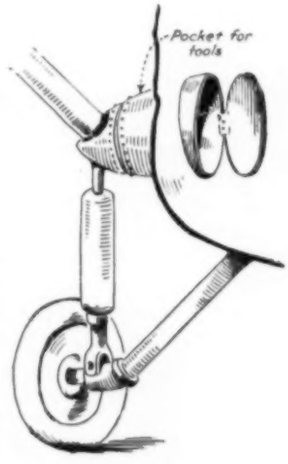
Parker-Kalon sheet metal screws to attach the fabric to the stamped duralumin ribs.

Refinement of a sort that will place aircraft in the same field as automobiles so far as public acceptance is concerned was evident in a few of the planes exhibited. The new Verville Air Coach, particularly, has no bracing members to mar cabin lines or vision from windows. This plane is well streamlined even to the degree of carrying the fuselage lines back into the lower portion of the rudder, and is finished as tastefully and expertly as the finest automobile.

That some order may materialize from the chaos of color schemes, which have heretofore been tried on various planes, was indicated by the Berry Brothers display with colored pictures of many popular airplanes. One of the planes in the exhibit of the Hamilton company had a Simonized exterior finish.

Trend Toward Monoplanes

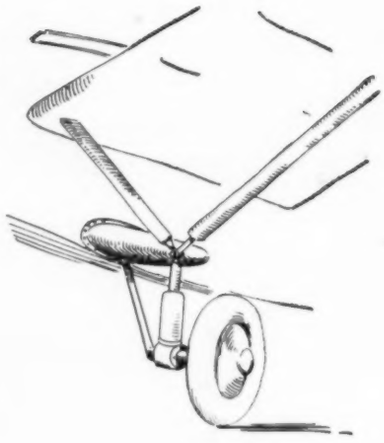
A steady trend toward the monoplane in new designs is indicated by the showing of one less monoplane than biplanes this year whereas there were considerably more biplanes than monoplanes shown last year. The latest designs bear out the belief of engineers that there will always be a field for both the monoplane and the biplane with the future trend probably indicated by the large number of light sport and training planes of biplane type, while the transports are monoplanes. The steps being taken by designers are further indicated in the presence at the show of seven folding-wing airplanes, six low-wing planes, three center-wing planes and fifteen planes with wings of cantilever construction without any external bracing.



The open plane led the closed in number of designs exhibited. Despite the great opportunity for seaplanes and flying boats, there were less amphibians and seaplanes shown this year than last.

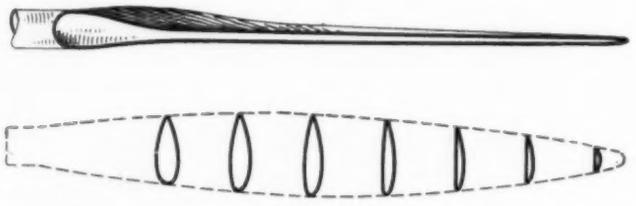
Of the light tri-engined class, the Kreutzer Air

Coach powered with three LeBlond engines, was the only representative. It is probable, however, that there will be more light multi-engined planes in the future.



The three-place open planes have not advanced in popularity, a lower percentage having been exhibited this year, but the three-place closed plane seems to have gained favor, for many monoplanes of this type were shown. There is evident a tendency toward the four-place plane providing a cleaner cabin interior than does that of the usual arrangement of a large number of seats. Five-place planes have decreased in numbers and six-place have increased greatly in numbers shown. An increased number of transport planes having capacities of 8, 10 and 12 persons were exhibited this year.

Planes equipped with radial engines have almost doubled while those using the water-cooled type have decreased more than 25 per cent. The engine problem in the 1,000—2,000-lb. gross weight class has been met by the radials of 50—165 hp. and by the four-cylinder-in-line, air-cooled types. Ten planes powered with in-line, air-cooled engines were shown where there were no installations of this type last year.



Hollow propeller built up of two flat sections of chrome-vanadium steel welded together

Planes in the 1,000—2,000-lb. gross weight range predominated in numbers and the increasing importance of the two-place tandem sport and training types was very evident.

Among the engines exhibited, one of the outstanding tendencies seemed to be in the direction of supercharging, and built-in impellers were embodied in many engines in the medium horsepower ranges of radial types.

Among the engines shown there were but three under 50 hp. but the majority of the remainder were in either the 50—100-hp. or above the 300-hp. classes, indicating that designers are attempting to develop more of the very light and very heavy engines, the medium classes being fairly well developed at the present time.

An air-cooled V-type engine was exhibited by the American Aeronautical Corporation, which is to build Isotta Fraschini engines in this country. This power plant develops 420 hp. with a dry weight of only 694 lb. Another Isotta Fraschini engine of particular interest was the type 80-T, a six-cylinder-in-line, air-cooled engine weighing 242.5 lb. and developing 80 hp. This power plant has the entire upper portion of the crankcase and all cylinders and fins cast in one piece with a separate head bolted to each cylinder.

The four-cylinder-in-line air-cooled type was represented by the Wright "Gypsy," the Michigan Screw Company "Rover," American Cirrus and Dayton "Bear" engines. One two-cycle engine of novel design was exhibited by the Hurricane Motors Corp. The new geared "Wasp" engine also was exhibited by the Pratt & Whitney Aircraft Company.

Included in the power plant exhibits was a propeller of unique design. This propeller, displayed by the Pittsburgh Screw & Bolt Corporation, was hollow, built up to two flat sections of S.A.E. 6130 chrome-vanadium steel welded together and unusually well finished.

A Supplementary Compensation Plan

In the "supplementary compensation plan" employed at the General Electric Company all employees, not in higher salaried positions, with five or more years of service, are paid a supplementary compensation of 5 per cent of their annual earnings. This payment is made semi-annually in cash or in bonds of the G. E. Employees' Securities Corporation.

Employees in important and supervisory positions in all departments, including administrative, engineering, manufacturing, and sales, are formed into groups having a common interest in and responsibility for the results attained by a department, a sales district, a factory, or other subdivision of the business. The elements of the responsibility of each group are defined and used as a basis for determining the efficiency of its operation. Periodical reports are prepared showing the progress of each group, and at the end of the year an extra compensation fund for each group is calculated upon the results. These plans embrace all branches of the organization, including the leading executives. The plans for this last group are based upon the net profit of a department or of the company, after provision for all expenses, including taxes, and a reasonable return on the investment.

As soon as possible after the end of the year the extra compensation earned is paid to the participants according to their ratings, in cash, in bonds of the G-E Employees' Securities Corporation, or in common stock of the company purchased in the open market.

The total of all supplementary and extra compensation paid for the year 1928 to 40,040 employees amounted to $7,431,137. During the year the company employed an average of 73,526 persons, whose total earnings were $134,056,000. The average annual earnings per employee in 1928 were $1,823, an increase of 1.7 per cent over the preceding year and 126 per cent over the average earnings in 1914. Since that time the cost of living has increased 62 per cent, indicating a substantial increase in real earnings.

The company operates a pension trust fund, which now amounts to $7,909,000, and has 877 pensioners, to whom $514,405 was paid in 1928. An additional pension plan went into effect last July. This provides that 1½ per cent of the earnings of employees is to be set aside as a fund in the hands of the pension custodians, and the accumulated principal and income are to be paid to the employees when they leave the employ of the company, or in the form of additional pensions upon retirement, or to the heirs in the event of death of the employee.

IDEAS · FROM · PRACTICAL · MEN

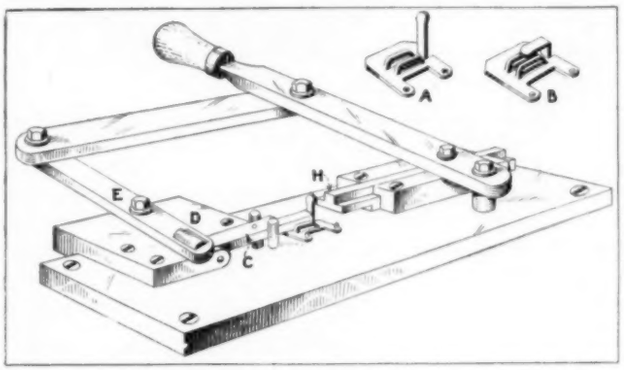
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

A Hand-Operated Bending Fixture

By Charles H. Willey
Asst. Plant Supt., Hoyt Electrical Works

The fixture shown in the illustration is for bending the part *A* to the shape to be seen at *B*. In operation, the part is slid under the bar *C*, where it is located on pins. When the bar is in the position shown, it is being held up by a spring to allow the part to go under it. The other end of the bar is hinged to the plate *D*. The arm, or lever, *E* is attached to the plate *D* and carries a roller near its free end.

Movement of the lever at the right, in the direction of



Fixture for bending a brass part

the arm *E*, brings the roller over the bar *C*, forcing it down and clamping the part under it. While this action is taking place, the slide *H* is moving toward the bar *C*, finally going far enough over it to bend down the tongue of the part. The levers work in unison by means of the cross link-attached to them.

Compensating Plungers for Fixtures

By E. H. Ingram
Birmingham, England

In designing jigs and fixtures, it is frequently advisable to arrange for supporting the work, or a part of it, on compensating plungers held up by springs.

A series of such plungers is shown in Fig. 1, all of the

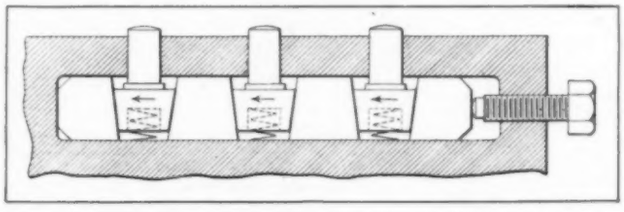


Fig. 1—Compensating plungers operated by springs

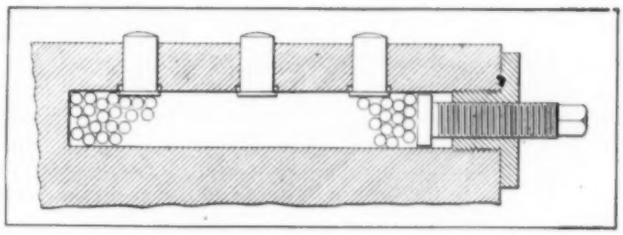


Fig. 2—Compensating plungers operated by balls

plungers being locked in position by a single screw. The plungers are made in two pieces. The lower pieces are considerably larger in diameter than the upper pieces. They are tapered about 5 deg. on each side, and have pockets for the upper ends of the springs. The tapered blocks at the screw end of the opening and between each of the plungers, moves to the left when the screw is tightened, and the lower part of the plunger slides off center with them.

The amount of taper on the blocks and on the lower parts of the plunger is inside of the angle of repose, so that the plungers cannot be forced upward when the

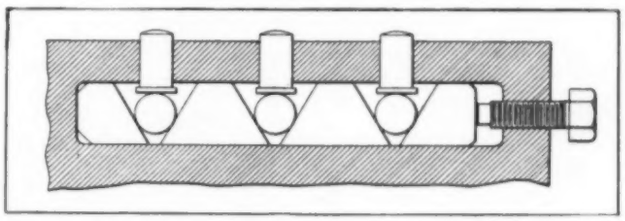


Fig. 3—Compensating plungers operated by wedges

blocks are tightened against them. The taper does, however, prevent them from being forced downward under the pressure of a heavy cut.

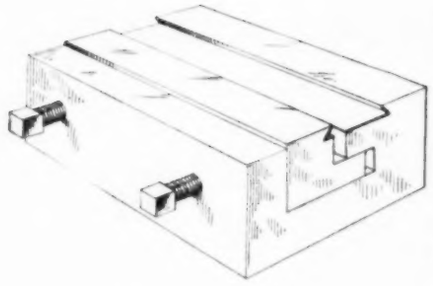
The plungers shown in Fig. 2 are operated by balls enclosed in a cylindrical opening, and which drive the plungers upward when they are forced together by the screw at the right. The inner end of the screw should be but slightly smaller than the diameter of the ball space.

Plungers that not only act as supports, but exert an upward force, are shown in Fig. 3. The method of operation is similar to that shown in Fig. 1, the difference being in the greater angle of the wedge blocks, also that the plungers are carried on cylindrical pieces.

A Holder for Forming Tools

By Henry M. Hunt

For several years we had more or less trouble with the holders for our forming tools. The loose jaws would be forced out of alignment when the holding screws were tightened and allow the tools to cock up on one side, so



A forming-tool holder

that they would not produce the proper shape. Finally, I happened to hit on the idea of making the holders as shown in the illustration. The tongue projecting from the bottom of the loose jaw is a snug fit in the slot in the lower part of the stationary jaw. It will be seen that this construction prevents the loose jaw from being forced out of alignment when the screws are tightened.

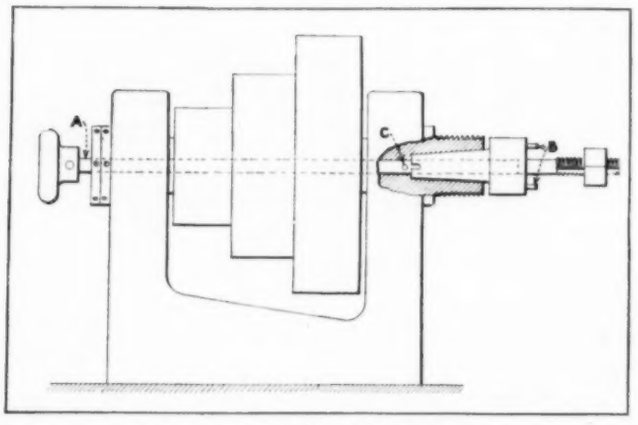
We now make all the holders for our forming tools in accordance with the design shown, and our troubles from having the tools cock up when being tightened, have ceased.

A Non-Reversing Tapping Device

By Arthur Kendall
Hamilton, Ont., Canada

At first sight it would seem impossible to run a nut on and off of a tap while the tap is running in but one direction. The illustration, however, shows a device by which it was done, enabling a large quantity of nuts to be retapped in quick time.

The body of the device fits tightly in the taper hole of the lathe spindle, and is drilled to take the rod *A*, which



Non-reversing tapping device

extends through the spindle and carries a wooden knob at the outer end. The front end of the rod is welded to the shank of the tap. The body is drilled to take the two pins *B*, and the tapered end is slotted to engage the pin *C* in the rod.

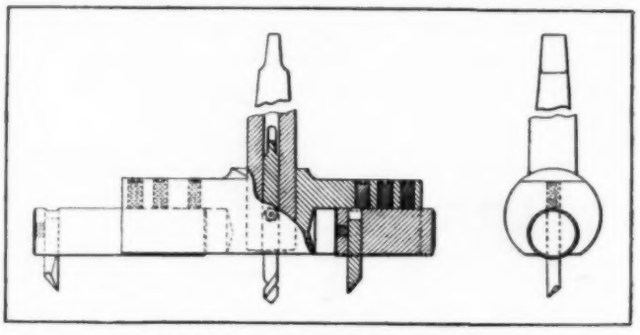
When the pin *C* is in the position shown, the device may be said to be in neutral. When the rod is pushed forward by the wooden knob, the pin engages the slot in the body, and both the rod and the tap revolve. The nut is grasped in the fingers and is run on the tap, and held by a pair of pliers. When the nut has been run far enough on the tap, the operator lets go of it and pulls back the rod by the wooden knob until the nut engages the pins *B*. By holding the knob tightly so as to prevent the rod from revolving, and pulling it back to keep the nut in engagement with the pins, the nut is run off.

An Adjustable Fiber Cutter

By W. H. Custer

Having to make large quantities of fiber washers of various sizes, and not having tools for the purpose that would stand up for cutting more than two or three washers, we made the tool shown in the illustration. The body is a piece of 2-in. round cold-rolled steel, drilled off center at each end and slab milled on the top and bottom. The slabbing on the top was done to leave a flat surface for drilling, for the setscrews and for holding the toolholders. That on the bottom was to cut away the metal at the lower wall of the hole, leaving a slot through which the toolbits could pass.

The toolholders are made of 1-in. round cold-rolled steel, and are each held in place by three safety setscrews. The toolbits are made from drill rod. A No. 2 extension



Tool for cutting fiber washers

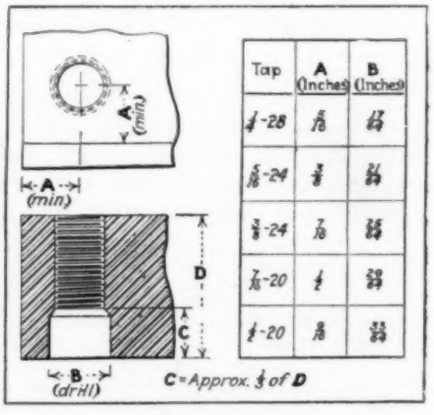
drill-socket, driven into the body of the tool and pinned, serves for driving the tool and for holding the drill that centers the tool and steadies the fiber sheet while the washers are being cut. By cutting half way through the fiber from each side, the washers will have smooth edges.

Minimum Drilling Distances for Tapped Holes in Die Blocks

By Charles Kirkbride

Many an otherwise perfect die block has been spoiled during the hardening process because the tapped holes for holding the stripper are drilled too close to the edge of the block.

The accompanying table indicates the minimum allowable distance that the holes should be drilled from the edge when using blocks of various thicknesses. It is, of course, preferable when designing the die to make the "A" dimension as large as possible, but years of actual experience have proved the minimum values expressed in the table to be safe.



Tap	A (Inches)	B (Inches)
¼-28	5/16	17/64
5/16-24	3/8	21/64
3/8-24	7/16	25/64
7/16-20	1/2	29/64
1/2-20	5/8	33/64

Minimum allowable distance from the edge for holes drilled in die blocks

Business Ethics

Co-operation among business men in adopting and enforcing sound group policies has led to the official adoption of codes of ethics by many associations. Probably no point has merited or received as much attention as purchasing and sales. The following extracts, from some of these codes give a summary of the more important points which are being emphasized in this campaign against wasteful competition and for such co-operation as is necessary to the intelligent and efficient operation of the individual industries.

National Association of Purchasing Agents

"Unnecessary sales and purchasing expense is an economic waste, a tax on legitimate industry. Its elimination will assure satisfactory profits to the producer, economy to the consumer, and greater efficiency in commercial relations.

"We recognize that the concern which buys must also sell, that buying and selling are companionate functions, that sound commercial transactions must be mutually profitable, and that co-operation between buyer and seller will reduce the cost of purchasing, sales and distribution with consequent benefits to industry as a whole.

"In furtherance of these principles, we subscribe to the following standards in our buying and selling:

1. To buy and sell on the basis of *value*, recognizing that value represents that combination of quality, service and price which assures greatest ultimate economy to the user.

2. To respect our obligations, and neither expressly nor impliedly to promise a performance which we cannot reasonably expect to fulfill.

3. To avoid misrepresentation and sharp practice in our purchases and sales, recognizing that permanent business relations can be maintained only on a structure of honesty and fair dealing.

4. To be courteous and considerate to those with whom we deal, to be prompt and businesslike in our appointments, and to carry on negotiations with all reasonable expedition so as to avoid trespassing on the rights of others to the time of buyers and salesmen.

5. To avoid statements tending to injure or discredit a legitimate competitor, and to divulge no information acquired in confidence with the intent of giving or receiving an unfair advantage in a competitive business transaction.

6. To strive for simplification and standardization within the bounds of utility and industrial economy, and to further the development of products and methods which will improve industrial efficiency.

7. To recognize that character is the greatest asset in commerce, and to give it major consideration in the selection of customers and sources of supply.

8. To adjust claims and settle disputes on the basis of facts and fairness, to submit the facts to arbitration if a mutual agreement cannot be reached, to abide by the decision of the arbiters, and to resort to legal measures in commercial disputes only when the preceding courses prove ineffective.

9. To provide or accept no gifts or entertainment in the guise of sales expense, where the intent or effect is to unduly prejudice the recipient in favor of the donor as against legitimate competitors.

10. To give or receive no bribes, in the form of money or otherwise, in any commercial transaction, and to expose commercial bribery wherever encountered for the purpose of maintaining the highest standard of ethics in American industry."

Foundry Equipment Manufacturers' Association

We agree "to take no advantage of a customer's ignorance to sell him any machine that we are not convinced is best suited to his purpose.

"To quote time of delivery only after careful production schedules have been made, and not to promise deliveries that cannot be reasonably made.

"To refuse to accept orders including unreasonable demands for service, terms, data, attachments, or any other thing not required by the usual competent buyer.

"To take no buyer's word as to a competitor's price, terms, time of delivery, guarantee of production, or any other material condition of a sale, for an ethical buyer will not disclose such matters to a seller's competitor.

"Not to solicit the cancellation of an order placed with a competitor, nor to accept such an order if offered, but to consider such orders as closed incidents.

"To maintain such a friendly attitude towards competitors as to enable us to meet them, and discuss frankly any question of mutual interest that we are permitted by law to discuss."

The Refrigerating Machinery Association

"The making or publishing of any false, untrue, or misleading statement concerning the business or business policies or methods of a competitor is unfair and should not be sanctioned or permitted."

Associated Equipment Distributors

"We shall refrain from entering into negotiations with any manufacturer for the sale of his product if a fellow member is selling the line in the same territory and is still under contract with said manufacturer. We agree to get into communication with the affected member and secure his assurance that any negotiations or acceptance of the factory contract will not injure him."

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Why Not a Scientific Length Standard?

ISN'T it high time for the metrological highbrows to stop squabbling over whether the international standard of length is a metal bar in Sevres, or one in London, or one in Washington, to which every other measure of length must be calibrated, and get down to some base that is reproducible in case something happens to the sacred original? Years ago, when the standards were set up, accurate measurement was a laboratory affair and the practical man looked upon it with amused tolerance. Now that he is called upon to measure as closely in the shop as his grandfather did in the laboratory his interest is no longer academic. He wants standards that are trustworthy and reproducible.

Why not secure international agreement to a standard value for the inch measured in wave lengths of a given monochromatic light, a value that will be acceptable both to the Bureau of Standards and to the National Physical Laboratory of Great Britain? Perhaps a better unit will be available ten or fifteen years from now, but we have no better one at present and the light wave length would be entirely adequate for current needs. It would also be equally standard on both sides of the Atlantic.

Isn't it worth thoughtful consideration now in order to save trouble later?

Playing Fair with the Payroll

ADEQUATE compensation, paying men what they are worth, is perhaps one of the hardest tasks of management. All managers are confronted with the problem of the aggressive individual who appreciates his own value at least 100 per cent, and who does not hesitate to use pressure to secure an increase. And whether we like to admit it or not, this type of man is very apt to receive more at the end of a given period, than the man who, because of a different mental make-up, does not or cannot sing his own praises so loudly. The line of least resistance is to advance the insistent individual and let the other chap get along at the old rate.

In the same way we are much more apt to appreciate the services of a man who gets us out of a hole than the man who keeps things running so that we never get into a jam. The expert who comes in and straightens out a few kinks in the routine of production can demand from one to three hundred dollars a day. But the superintendnet who keeps us out of such difficulties is expected to be content with a very moderate salary.

Going still farther down the line, there is the all-around mechanic who keeps the various automotive and semi-automatic machines in operation. He is to the machine what the Chinese doctor is to his patient, paid to keep it in a healthy condition. Yet it is no uncommon to find operators on piece work getting a fatter pay envelope than the man who has spent years in learning how to diagnose machine troubles to prevent shutdowns, or, if they occur, to get the machine running again in short order.

It is quite probable that some of the complaint at the lack of skilled men in industry can be traced to the lack of an equitable standard of compensation based on actual value to the concern or the industry. When machines or organizations are running smoothly we think only of the actual production and not of the men behind the machines, who make it possible. If we showed more appreciation of these men when things are running right, there might be fewer emergencies and less need for high-priced experts.

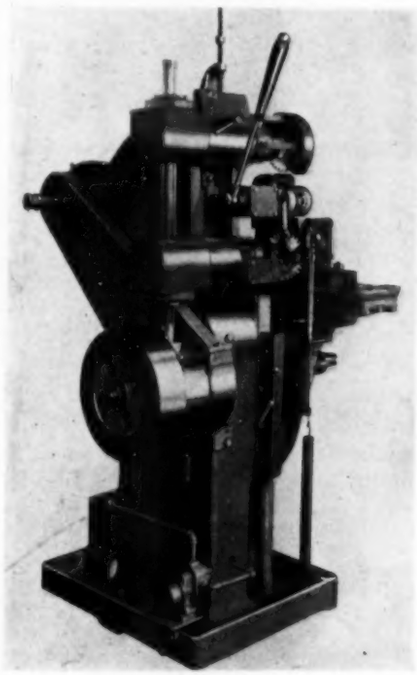
Lack of Knowledge Concerning Machine Layouts

COMPLAINT comes from a large user of machinery that many machine builders fail to supply adequate information as to floor space, depth of foundation required and other details that should be given to purchasers. Layout plans that show sufficient details to enable the millwright to arrange for foundations, to locate the machine correctly, and to know where the driving pulleys, if, any, will be, should be available.

Such information is vital in laying out a new department, or in adding new machinery in one that is already established. The National Machine Tool Builders' Association adopted a standard layout diagram some years ago that has proved very satisfactory to machine users generally. But, according to this user, those who handle the correspondence in the machine builders' office do not even seem to know what a layout diagram is. As a result much time is lost in correspondence before the desired information is secured.

Kent-Owens Double-Spindle Opposed-Feed Milling Machine

INTENDED especially for piston slitting and similar operations, the No. 1 double-spindle opposed-feed milling machine has been placed on the market by the Kent-Owens Machine Company, 958 Wall St., Toledo, Ohio. The machine illustrated is equipped with a fixture for this purpose. Both slots are milled in the skirts of aluminum pistons at a rate of 600 to 1,000 pieces per hour, dependent on the size. The fixture is entirely automatic except for the placing and removing of the work. As the hand lever is dropped down and the heads approach each other, the piston blank is clamped automatically before the cutters strike it. After completion of the cut, the cutters are withdrawn from the work by raising the hand lever and the piston is freed automatically. A counterbalanced feed arrangement through a simple rack and pinion makes operation easy and rapid.



Kent-Owens Double-Spindle Opposed-Feed Milling Machine

Both spindles and the backshaft are mounted on Timken tapered roller bearings, which permit the high speed necessary for small diameter cutters and for milling brass, aluminum, and other soft materials. A flywheel type pulley and a sturdy box section frame insure smooth operation.

The column has deep sections and is ribbed throughout and the base is troughed for catching chips and oil. Knee, cross-slide and table have deep sections and large surface bearings to insure rigidity. A large coolant tank is cast integral with the base. Working surface of 22 in. long by 5 in. wide with a standard $\frac{5}{8}$-in. T-slot is provided for the table.

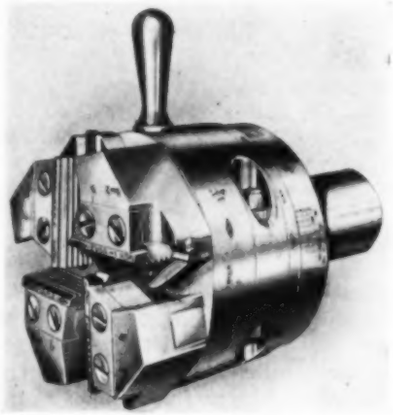
Distance between spindles is $4\frac{3}{4}$ in. minimum, and $12\frac{1}{2}$ in. maximum. The horizontal table feed of 4 in. may be obtained by means of a hand lever and 17 in. by means of a crank. The cross-saddle feed is 5 in. Lever feed movements are limited by positive stops.

The spindles have a No. 9 B&S taper hole and are heat-treated and ground. They are driven through a silent chain and splined shaft and hardened alloy steel bevel gears mounted on ball bearings. The cone pulley has two steps and the backshaft is mounted on Timken taper roller bearings, front and rear. When belt drive is specified, the countershaft is shipped complete with shifter, tight and loose pulleys, and a two-step cone pulley. If motor drive is desired, a 3- to 5-hp. unit is recommended.

The floor space required overall is 34 by $48\frac{3}{4}$ in. The net weight is 1,400 pounds.

Landis Type F "Landmatic" Diehead

A new type of "Landmatic" diehead for application to turret lathes and hand-operated screw machines has been designed and placed on the market by the Landis Machine Company, Waynesboro, Pa. The new head, the "F-Type Landmatic," was developed to meet the demand for a diehead to produce full and correct threads when the stock runs out of line, such as is the case when the stock is slightly bent, when the turret and spindle are out of line, or when the gripping mechanism grips the stock off-center.



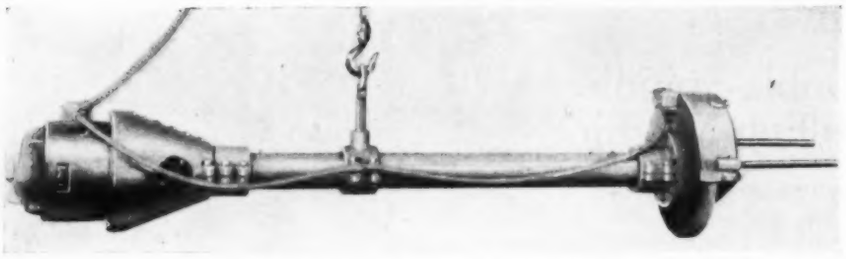
Landis Type F "Landmatic" Diehead

The head floats or flexes on the shank. It is thus free to center itself around the center of the stock, and produces a full thread, even though the stock revolves eccentrically. Flexibility is controlled by two heavy springs which return the head to the central position when it is not necessary to be off-center. The locking mechanism is entirely independent of the shank, and floats with the head proper. The driving torque is transmitted directly from the shank to the head body, and is also independent of the rest of the head. The head is opened automatically by retarding the forward motion of the carriage, and is closed by hand.

The chasers are supported on the face of the head to give maximum chip clearance and convenient access when it is necessary to remove them for grinding. The head is made of a high grade of carbon steel, heat-treated throughout and ground, to reduce wear to a minimum and prolong service. The adjusting worm is under correct turning tension at all times, thus eliminating the necessity of locking it after each adjustment for size.

Kinney Balanced Swing Frame Grinder

Direct motor-drive balanced swing frame grinders, adapted to grinding billets, rails and castings, as well as for dressing oil well tools, are being manufactured by the Kinney Iron Works, Los Angeles, Calif. The motor is connected directly to the wheel through a flexible coupling and



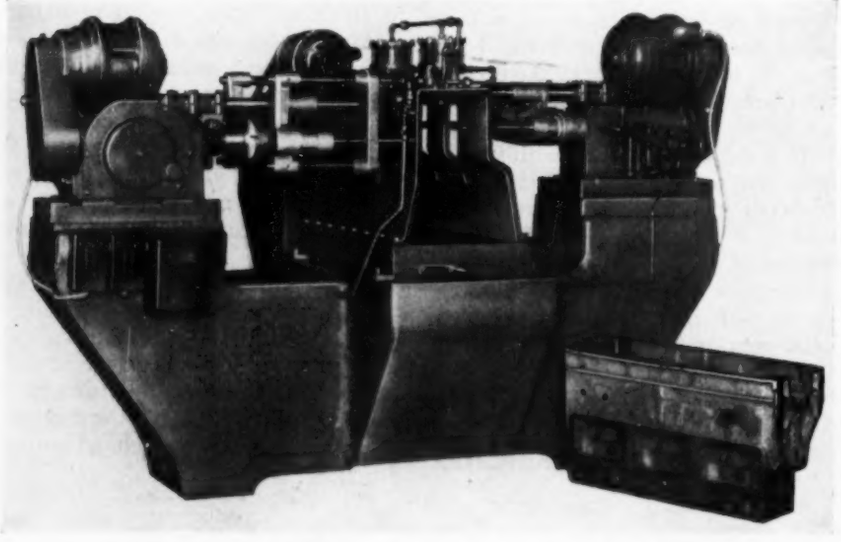
Kinney Balanced Swing Frame Grinder

a heavy shaft, and is started and stopped by a switch at the wheel end. Both ends of the shaft are mounted in heavy dustproof ball bearings. The wheel runs at right angles to the frame, which minimizes the danger to the operator, besides allowing him to see his work at all times. The grinder can be hung from a chain block, and is provided with a sliding collar to keep it in balance as the wheel wears.

Bradford Three-Way Cylinder Block Reaming Machine

REAMING of the water-jacket holes in cylinder blocks at the rate of one block every 30 sec. can be done on the three-way machine announced by the Bradford Machine Tool Company, 657 Evans St., Cincinnati, Ohio. The machining time required is 16 sec. and the handling time 14 sec. The machine is designed to be used in connection with the shop conveyor system, and the conveyor is attached to the front of the machine on a level with the bottom of the fixture. From the conveyor the operator slides the cylinder block on to the hardened slide strip on the bottom of the fixture, which locates the work in position by means of dowel holes in the bottom of the flange. The dowel pins are lifted into position or withdrawn by the hand lever at the top of the fixture. Two air-actuated rams controlled by a valve at the top of the fixture clamp the work in position.

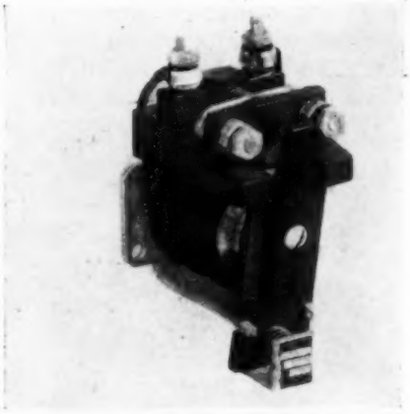
The feeding mechanism on all heads is tripped simultaneously by the control valve on the side of the fixture, this mechanism being shown on the head at the right. The seven water-jacket holes are reamed to 0.943 in. in diam. in cast iron and the stock removed is $\frac{1}{32}$ in. on the diameter. A spindle speed of 350 r.p.m. is used.



Bradford Three-Way Reaming Machine adapted to reaming water-jacket holes in cylinder blocks

General Electric Power-Failure Warning Relay

For use on various types of alarm circuits, this CR-2810-1245 relay has been announced by the General Electric Company, Schenectady, N. Y. The device is of the normally-closed type and functions to actuate a warning signal on the failure of power.

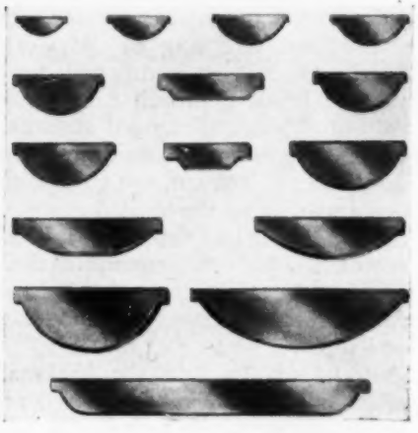


General Electric Power-Failure Warning Relay

It is strongly built, of simple construction, and operates quietly. The double-break contact construction is of the silver-to-silver type. The device is made in standard ratings.

Morton "Hi-Pro" Keys

Recently the business, good will, and patents of the former Dyett Auto Products Company, Little Falls, N. Y., were purchased by the Morton Manufacturing Company, East Broadway and Hoyt St., Muskegon Heights, Mich., and the former's line of keys has been renamed as the "Hi-Pro"



Forms of the "Hi-Pro" key

keys. The general types of this key are shown in the accompanying illustration. It is claimed to save 50 per cent of the labor required in fitting, and will not rock or roll in the shaft. Skilled labor is not required to cut the keyways. The key can be removed from the shaft without injuring it by driving a chisel under it.

Hi-Pro keys are available in thicknesses from $\frac{7}{16}$ to $\frac{3}{8}$ in., and in lengths from $\frac{1}{2}\frac{7}{2}$ to $1\frac{9}{16}$ in. The depth of the semi-circular portion ranges from 0.141 to 0.485 in., and the depths of the projections at the ends range from $\frac{1}{16}$ to $\frac{5}{32}$ inch.

Brown & Sharpe No. 2 Plain and Universal "Standard" Milling Machines

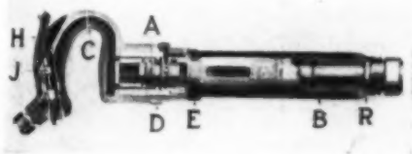
A NO. 2 universal and a No. 2 plain have been added to the line of "Standard" milling machines manufactured by the Brown & Sharpe Manufacturing Company, Providence, R. I. They are similar in many ways to the No. 1 machine described on page 369, Vol. 69, of the *American Machinist*, but they are of the cone drive type, and as such are particularly suited for toolroom installation and for light manufacturing. The cone pulleys are mounted on sleeves on the machine spindles. A fast and slow series of spindle speeds are available with the slow series obtained through backgears easily engaged by a lever on the left-hand side of the machine.

Two operating positions are provided, one at the front and one at the rear of the table, with all levers controlling the operation of the machine readily available from either position. All changes in the power feed of the table are made by rotating either of the feed change levers, which are located conveniently at the front and rear operating positions. One revolution of either lever to the right or left accomplishes a change of feed. The rate of feed engaged is shown on both of the direct-reading dials. These dials are set at an angle to facilitate reading, and are provided with glass windows to prevent clogging by chips and dirt.

The one-piece knee elevating screw assures accuracy in vertical adjustments, according to the manufacturer. It is completely inclosed in a steel sleeve and does not extend below the base of the machine. The overarm is firmly clamped at two points by a single lever at the front of the column. Filtered oil is provided automatically to all bearings within the column by a plunger pump. A gage on the side of the column indicates the pressure. Another pump automatically lubricates the knee mechanism, while a large well at the foot of the saddle oils the complete saddle mechanism and all of the table bearings.

Boyer Riveting Hammers

Simplicity in design is the outstanding feature of the improved Boyer riveting hammer announced by the Chicago Pneumatic Tool Company, 6 East 44th St., New York, N. Y. The entire valve unit is composed of only three members, a valve case, a hollow cylindrical valve, and a valve case lid. The valve unit is



Boyer Long Stroke Riveting Hammer

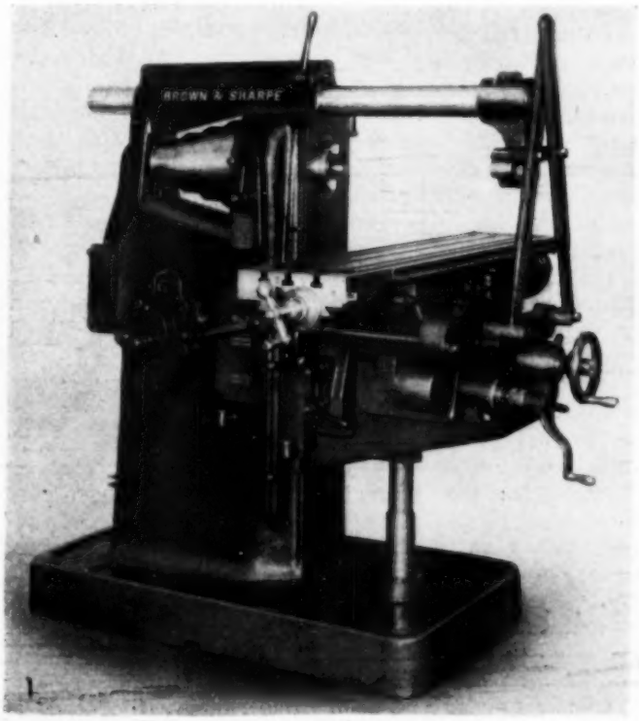


***Fig. 1**—Front view of the Brown & Sharpe No. 2 Plain "Standard" Milling Machine showing the operating controls*
Fig. 2—Rear view of the machine

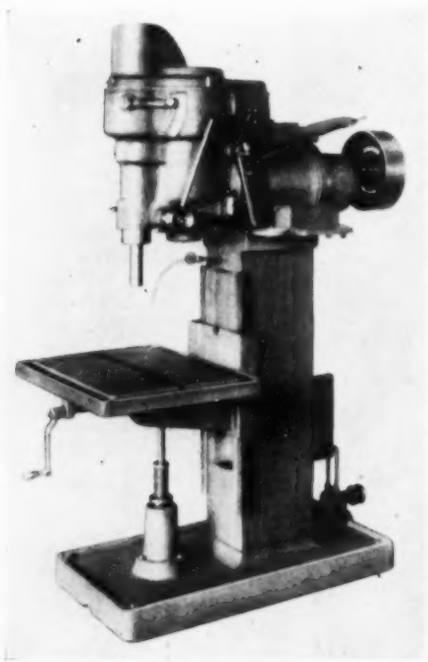
given a snug fit and doweled in place in the head of the cylinder. In operation, the piston passes through the valve. This construction provides several advantages, which are: Shorter overall hammer length, speedy, powerful stroke, large airports, prevention of sluggish action, and a cushioning effect. It also removes all possibility of the piston striking the handle on return strokes. The improved hardened and ground unit is interchangeable with the original unit.

Referring to the illustration, *A* is the hollow, cylindrical valve, *B* is a heat-treated special steel cylinder fitted into the handle, *C* is the handle, *D* is the locking ring surrounding the cylinder and preventing the handle from unscrewing or loosening, *F* is the exhaust deflector, adjustable to any radial position, *H* is the trigger control conforming conveniently to the operator's grip, *J* is the throttle valve, heat-treated to resist wear, and *R* is the Boyer spring clip retainer.

The standard Boyer long stroke riveting hammer is built in seven sizes in capacities for $\frac{5}{8}$- to $1\frac{1}{2}$-in. rivets. The overall length varies from $14\frac{3}{4}$ to $23\frac{3}{4}$ in., and the weight from $15\frac{3}{4}$ to $28\frac{1}{2}$ lb. The heavy long stroke riveting hammers are built in three sizes, in capacities for $\frac{7}{8}$- to $1\frac{1}{4}$-in. rivets. Overall lengths range from $17\frac{5}{8}$ to $20\frac{5}{8}$ in., and weights from $23\frac{1}{2}$ to $26\frac{1}{2}$ pounds.

Gaterman No. 5 Heavy-Duty Tapper

FOLLOWING the design and principle of the No. 10 heavy-duty tapper, a No. 5 model has been placed on the market by the W. Gaterman Manufacturing Company, Franklin and 15th St., Manitowoc, Wis. Improved models of the No. 10 tapper were described on page 1056, Vol. 68, of the *American Machinist*. The No. 5 tapper can be furnished in two ratios from the front spindle to the tap spindle, the first giving a capacity of $\frac{1}{8}$ to $\frac{1}{2}$ in., U.S.S. taps in steel. The spindle speeds in this case are 425, 575, 750, and 1,000 r.p.m. The second ratio gives capacity ranging from $\frac{1}{4}$ to $\frac{3}{4}$ in., U.S.S. taps in steel, with spindle speeds of 212, 285, 375, and 500 rev. per minute.



Gaterman No. 5 Heavy-Duty Tapper with oscillating spindle for both forward and reverse

An oscillating mechanism has been provided on the spindle to back it out automatically when it sticks, thus allowing the tap to free itself and then to go forward again. This feature is applied to the No. 10 also. This movement is actuated so rapidly that it is almost unnoticeable to the eye, but as soon as the resistance to the tap is less than the predetermined resistance, the spindle will not oscillate but will move forward until the tap reaches its proper depth, when it will reverse and back out of the work. This oscillation is also carried out on the reverse motion of the tap spindle.

The air cylinder placed on top of the clutch spindle engages the clutches from reverse to forward, but as soon as a tap has reached the proper depth, the tap trips the valve feeding the cylinder, and a compression spring underneath the forward clutch forces the forward clutch out of its seat and the reverse clutch into its seat. Thus it will be seen that pneumatic control of the spindle is obtained only on the downward stroke. The pneumatic control valve is operated from the spindle feed lever shaft.

Transmission, forward and reverse-gear and clutch, and spindle feeding assemblies are complete pre-assembled units inserted into the machine head. All of these assemblies may be removed for adjustment or repairs. The clutch gears are driven through a Bakelite double pinion, while the cone clutches are of special aluminum alloy. The spindle assembly, which carries the oscillating control is driven through a hardened-steel bull gear driven by hardened-steel pinions on the clutch spindle. With this type of drive, any ratio required can be had between the clutch spindle and the tapping spindle by using gears of the proper ratio. This spindle is carried by four tapered roller bearings.

The machines are regularly furnished with hand lever feed to the spindle, but a pneumatic spindle feed and foot trip can be furnished extra. This air feed provides for a quick advance to and from the work being tapped. Lubrication of the machine is effected by means of both splash and force feed systems.

The No. 5 tapper will tap to a depth of 5 in. The distance from the column to the center of the spindle is 10 in. Overall dimensions of table, $19\frac{3}{4}$x$24\frac{1}{2}$ in. Vertical adjustment is 18 in. Overall dimensions are 34x 26 in., and the approximate weight is 1,000 pounds.

"Flex-Mor" V-Belt Drive

A recent development in the V-belt drive, known as the "Flex-Mor" Drive is a product of Fairbanks, Morse & Company, Chicago, Ill. As shown in Fig. 1, the belts are built up of an outer belt jacket of duck

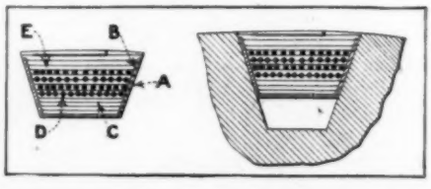


Fig. 1—"Flex-Mor" V-Drive Belts are built up of ducks A *and* B, *special compounded rubber* C *and* E, *and layers of cords* D

treated with rubber, inclosing a core made up of a layer of rubber, several layers of rubber embedded cords, and another layer of rubber above the cords. The rubber-embedded cords are laid at the neutral axis of the belt and are made of long-staple cotton similar to that used in cord tires. The layer of rubber above the cords is compounded to withstand tension, and the layer of rubber below the cords

Fig. 2—Multiple V-belts are essentially adaptable to short-center vertical drives through a wide horsepower range

is compounded to withstand compression. The various elements of the belt are assembled in the molds and are then vulcanized into a unified structure.

The sheaves are made of semi-steel, with angle and depth of groove designed to reduce belt slippage to a minimum. The belt makes a gradual contact with the grooves as it bends around the sheaves, and due to the working action and the elastic qualities of the belt, there is no sudden grabbing of the load, with consequent shocks to equipment.

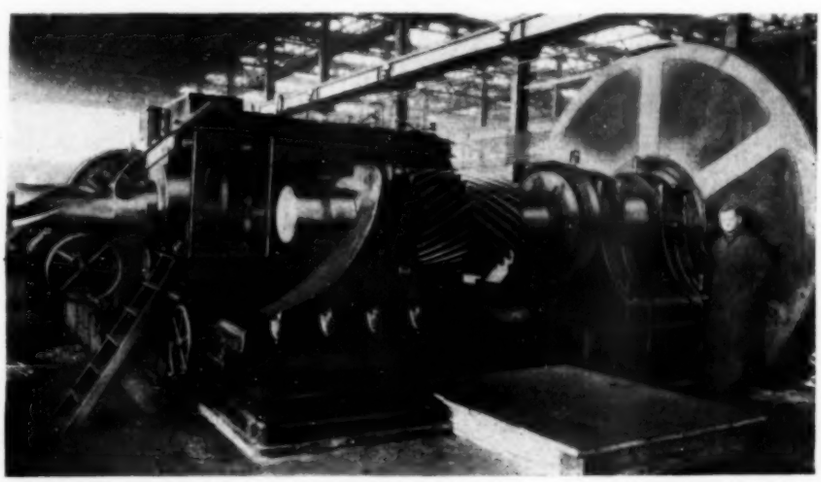
Endless V-belts run in a large selection of standard lengths, and are available for transmitting power from a fraction of a horsepower up to 200 and more, for either reducing or increasing speeds, and at practically any required center distances.

Advantages claimed for these belt drives are: High efficiency, increased speed ratios, possible use of higher speed motors, very short center distances with conservation of floor space, flexibility, elimination of vibration and shock, low bearing pressure, total belt tension practically equal to the driving tension, absence of tension on the return side, no belt dressing or lubrication required, and low maintenance cost.

Sykes 19-Foot Gear Generator

THE Farrell-Birmingham Company, Inc., 344 Vulcan St., Buffalo, N. Y. has developed and built an improved Sykes gear generating machine to generate helical, spiral, and herringbone gears of larger pitch diameter than hitherto has been possible. On this machine gears up to 19 ft. in diam. with a 54-in. face width, can be made. Continuous herringbone teeth up to 0.75 D.P. and straight-toothed gears up to 6 in. C.P. can also be cut. Cutters and slides range up to 18 in. pitch diameter. Gears can be cut integral with their shafts up to shaft diameters of 22 inches.

The machine is 25 ft. long, 20 ft. wide, and 12 ft. high above the floor line. The indexing wormwheel is 12 ft. in diam. and the cutter index wheel is about 3 ft. in diameter.



Sykes Gear Generator for cutting gears up to 19 ft. in diameter and 54-in. face width

King Interchangeable Punches and Punch Retainers

A complete line of interchangeable punches and punch retainers, embodying improved features which can be incorporated into any piercing

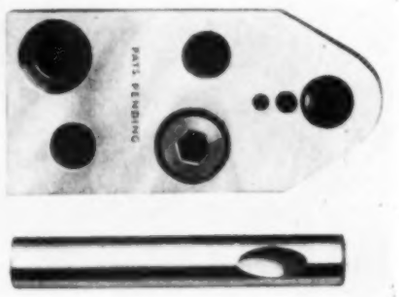


Fig. 1—View of the King Punch and Punch Retainer

die whether single or in gangs, has been brought out by the King Works, Detroit, Mich. A broken punch can be removed and a new one inserted in a very short space of time without removing the die from the press.

An outstanding feature of the device, shown in Fig. 1, is the high factor of safety against stripping

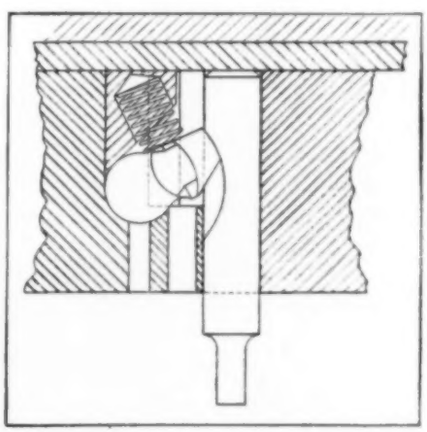


Fig. 2—Cross-sectional view showing the method of holding a punch in place in the die

strains, no matter how great the load or thickness of metal, it is said to be readily and easily removed, because it cannot upset or freeze. The cross-section, Fig. 2, shows how the holding element acts as a prop, with the retaining feature equivalent to the head on the old-fashioned punch. By this method there is no wedging or bind-

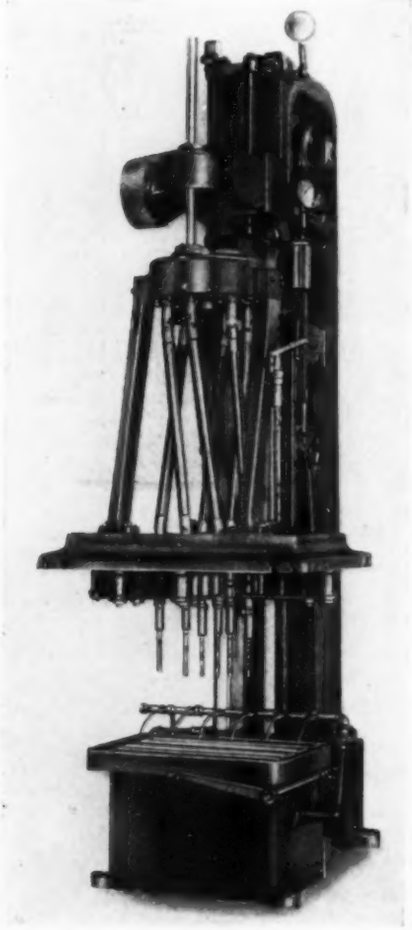
ing action. Stripping strain does not affect the ease of releasing the element to withdraw the punch. Therefore, the punch is readily interchanged when used in heavy or light gage metals. Releasing of the punch is simple: the prop is pressed against by an extractor, and the punch drops.

It is a simple matter to line up the punch with the die hole, as the punch is flexible and can be moved up or down before the punch is locked into position by action of the prop. Punches and retainers are made in all sizes and the retainers in three distinct shapes that lend themselves to every conceivable method of grouping holes.

Moline No. 114-U "Hole Hog" Multiple Drill

ANOTHER universal joint machine, known as the No. 114-U, has been added to its line of multiple drillers by the Moline Tool Company, Moline, Ill. The outstanding features of this machine, illustrated below, are: Oilgear feed, Texrope drive, V-guides for the slide and column, one-shot lubricating system, and a patented vertical adjustment of the spindles.

The column is of very deep box section, and is bolted to the reservoir base. A T-slotted work table is bolted to the top of base. Upper part of column is cored out for the motor, which is adjustable for tightening the Texrope belts driving the speed mechanism, as well as for the flanged Oilgear pump directly beneath it. The drive is through the spiral gears to the main vertical drive shaft, and then through spur gears to individual drivers in the circular head, from whence the power is transmitted to the lower drilling spindles through universal joints. The machine is equipped with driving unit for twelve spindles. The illustration shows a machine with six spindles; the remainder can be added as required. Long drive shafts are used between the universal joints, reducing angularity to a minimum and thereby insuring longer life to joints. This construction also permits the use of a longslide bearing on the column.



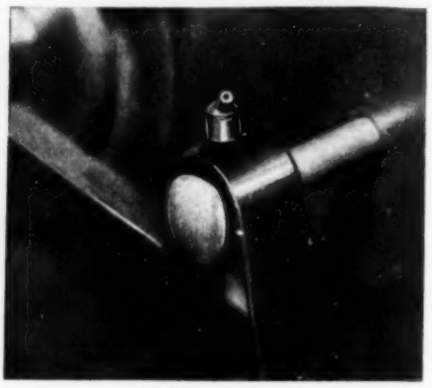
Moline No. 114-U "Hole Hog" Multiple drill

Oilgear equipment is used for the feed, consisting of a special QS type pump provided with a flange so that it may be inserted within the column and bolted to the side. A 4½x24-in. cylinder is mounted at the top of column. The feed is adjustable within the Oilgear unit, and can be set to give any feed that the drills will stand. The working cycle is automatic, and is controlled by the lever at front of the machine. Spindles are adjustable vertically for wear of drills by means of a patented feature.

The capacity is twelve $\frac{11}{16}$-in. drills when drilling in mild steel. Each spindle is bored No. 3 Morse taper. Minimum center adjustment of spindles is 2⅛ in. Minimum distance from spindle nose to table is 4 in. Maximum distance from spindle nose to table is 28 in. Adjustment of spindles within rectangle is 12x30 in. Weight of machine is 11,500 lb. A 10 hp. 1,200 r.p.m. motor is recommended.

Alemite Oil Hole Drive Fitting

A drive fitting, illustrated below, has been placed on the market by the Alemite Manufacturing Company, 2650 North Crawford Ave., Chicago,

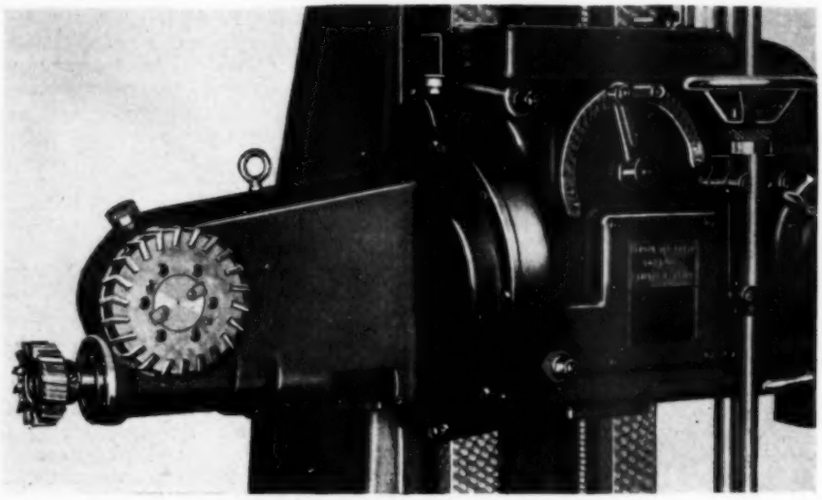


Alemite Oil Hole Drive Fitting shown in place

Ill., for closing open oil holes. By means of this device, all drippage is entirely eliminated and product spoilage is stopped. A reverse, featheredge bushing is driven into open oil holes by means of a special tool. These bushings are made in $\frac{1}{16}$-in. sizes from ⅛ to ½ in. Special bushings are made for countersunk holes and for thin housings. Into the top of the bushing a nipple with dirtproof ball check valve is installed, by means of another special tool. The completed oil hole fitting permits a means of lubricating the bearings by means of a high-pressure oil or grease gun.

Giddings & Lewis Combination Side and End Milling Head

A combination side and end milling head has been designed for the Nos. 45 and 50 high-power, precision, horizontal boring, drilling, and milling machines manufactured by the Giddings & Lewis Machine Tool Company, Fond-du-Lac, Wis. This head is useful for the milling of such work as the slideways and bolster plate surfaces of punch press frames. However, to mill the bolster plate surface with a cutter on the end of the spindle, because of the amount of overhang in most cases, requires a large diameter spindle calling for a machine of far greater capacity and



Giddings & Lewis Combination Side and End Milling Head for the Nos. 45 and 50 High-Power Horizontal Boring Machines

range than needed to take care of the work. This head is more compact and can be used easily.

It is made in two sizes, 10 and 12 in., bearing large cutters of corresponding diameters. The small cutters on each are 5 and 6 in. in diam., the reach being 27 and 32 in., respectively. A No. 5 Morse taper is provided for the small cutter on the smaller size, and a No. 6 on the larger size.

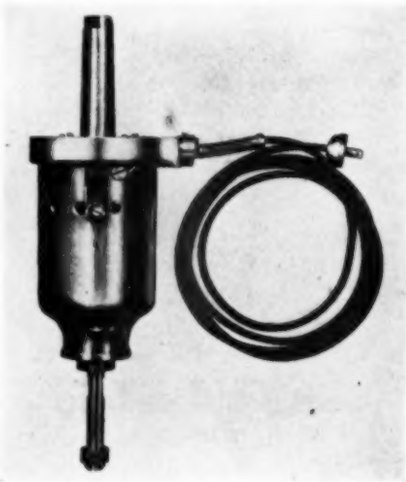
Power for driving the cutters is received from the boring machine spindle. A spur gear with a Morse taper arbor is placed on the spindle, which is extended until the gear meshes with the gear on the end of the wormshaft to which the small milling cutter is attached. The large cutter is driven from the small cutter shaft through a hardened and ground alloy steel worm and bronze wormwheel. The speed of the large cutter is always one-fourth of the speed of the small cutter, which has the same spindle speed as the machine. All the bearings in the attachment are of the heavy combination radial and thrust ball type, and together with the worm are packed in grease and completely inclosed. A draw bolt, accessible from the hand hole, is used for drawing the small milling cutter arbor into the socket.

Olofson Precision Grinder

For the accurate grinding of tools, semi-circular slots, and similar die room and toolroom jobs, the Progressive Tool Company, Fenton, Mich., has introduced a new type of tool known as the Olofson Precision Grinder. This tool can be used on any one of the standard vertical or horizontal boring machines, milling machines, and drill presses by means of the tapered shanks.

The part to be ground is clamped in a vise or on a machine table, moved into position with the grinder for the grinding operation, and not removed from the clamp until the work is completed. A special adapter in combination with a holder for insertion in a toolpost enables the grinder to be used for internal grinding operations in a lathe. This attachment is furnished extra.

The motor is of the universal type, operating at 10,000 r.p.m. The motor case turns at the same speed as the machine spindle in which it is inserted. The motor spindle is mounted in ball bearings. The quill is removable and runs true to a high degree of accuracy.



Olofson Precision Grinder

Through the graduated dial adjusting screw near the top, working in conjunction with the slide, an offset adjustment is made that results in an eccentric travel of the grinding wheel. This adjustment allows for a 1 in. variation on the diameter. High accuracy, both in diameter of holes and in center-to-center distances, is claimed for the device.

Toledo Small-Parts Counting Scale

Designed specifically for counting of small parts, such as screw machine products, a scale with a capacity up to 40 lb. of work has been developed by the Toledo Scale Company, 270 Madison Ave., New York, N. Y. This scale, which is of the bench type, is compact and accurate, and has sufficient sensitivity to register even a small screw.

The mechanism of the scale is simple. The chart has only the words "under" and "over" on either side of the zero mark. When the indicator splits zero, the desired number of parts is obtained. There are three

Toledo Small-Parts Counting Scale having 40-lb. capacity

pans, the weighing scoop on the platform and the two balancing pans hung from the auxiliary lever, which is in turn fastened by a rod to the ratio beam, which is extended from the platform. The right hand pan has a ratio of 99:1, and the other has a ratio of 9:1. To get an unknown quantity, the parts are placed in the heavy scoop on the platform. To get the number of parts in hundreds, sufficient parts are put into the right-hand pan so that the indicator approaches zero. To get the number of tens, more parts are taken from the

scoop and placed in the left hand ratio pan until zero is reached. The total number of parts is the sum of these counts with what is left over from the tens count.

Hisey-Wolf "Texdrive" Buffing and Polishing Machine

Mounted on a flat base securely attached to the main frame, the motor on the "Texdrive" buffing and polishing machine, announced by the Hisey-Wolf Machine Company, Cincinnati, Ohio, drives the spindle through Texropes. The base has planed ways on which the motor slides so as to secure the proper belt tension. By mounting the motor starter on the inside of the door, as shown, it is accessible, yet out of the way. Louvres in the end door keep out dust and permit circulation of the air. The starter is of the automatic type, providing protection from low voltage, phase failure, and overload.

The extra-large spindle, made of nickel steel, runs in two ball bearings ordinarily, but Timken roller bearings can be provided without extra charge. A labyrinth seal covers the bearings, thus preventing dust from getting in. The bearing boxes are keyed to the column so as to maintain rigidity of spindle and accuracy of alignment. The oil chambers are filled through convenient cups, and gages indicate the oil level. The base is a one-piece casting with the weight at the bottom.

Hisey-Wolf "Texdrive" Buffing and Polishing Machine

REVIEW · OF · RECENT · PATENTS

Relating to the Machinery and Metal Products Industries

Metal-Working Machinery

The Foote-Burt Co. was assigned patent 1,705,499 on a vertical drilling machine in which the change-speed gear is in a unit inclosed in the frame and capable of being assembled before being secured in the frame.

A heat-treating furnace patent, 1,705,627, assigned to the Chrysler Corporation covers a furnace having tracks and work-carrying blocks running through, and a chute discharging to the quenching bath.

In a recuperative heat-treating furnace patented, 1,705,606, and assigned to the Westinghouse Electric & Manufacturing Co., the heating chamber has a rotating series of chambers in front. These can be moved to bring each movable chamber successively in alignment with the heating chamber to facilitate charging and discharging and to effect preheating of the parts.

A heat-treating furnace was patented, 1,705,704, and assigned to the Westinghouse Electric & Manufacturing Co. It consists of a furnace with an annular heating chamber with a rotary conveyor having tilting material-conveying trays.

Parts and Mechanisms

The Lehmann Machine Co. was assigned patent 1,705,545 on a lathe-carriage feed mechanism having an endless sprocket chain secured to the carriage and means of driving the chain by a worm.

A carburizing box with a cover which slides the U-shaped flanges was patented, 1,705,674, and assigned to the Westinghouse Electric and Manufacturing Company.

A universal joint patented, 1,705,731, and assigned to Thompson Products, Inc., has a pair of plates with peripheral sockets to form seats for ball bearings.

Two patents, 1,705,886 and 1,705,887, on methods of producing hypoid gears were assigned to the Gleason Works. They consist in generating the teeth by moving the tools across the face of the tapered gear blank while rotating the blank on its axis and simultaneously producing an additional movement between the tool and the blank.

A roller-bearing mounting patented, 1,706,045, and assigned to the Western Harvester Co., covers a retaining ring secured to a sheet-metal wall and having an L-shaped flange to permit the housing to rock freely.

A hydraulic cushion for presses was patented, 1,706,073, and assigned to the Marquette Tool & Manufacturing Co. It consists of a cylinder under the press, with a conduit for leading the liquid back and forth from one side to the other of the piston, and the necessary control valves. A patent, 1,706,074, on a pneumatic pressure cushion for presses was assigned to the same company. It covers a number of pressure pads with a pneumatic element on one pad, and a hydraulic cylinder on another pad.

A stripper mechanism for punch presses was patented, 1,706,075, and assigned to the American Car & Foundry Co. A stripper bar is connected to a clamping bar on the head, and is operated by a cam..

The Geometric Tool Co. was assigned patent 1,706,104 on a diehead, which has a combined chaser-retracting and chaser-retaining top, having radial movement and rocking movement. Another patent, 1,706,105, assigned to the same company, covers a diehead having a sliding chaser-operating sleeve coacting with all the chasers and adapted to assume chaser-closing, chaser-retracting, and chaser-clearance positions.

A power press control patented, 1,706,141, and assigned to the Hamilton Press & Machinery Co. covers a manually-operated clutch control lever, which will permit stopping of the press at a predetermined point.

The Stuebing-Cowan Co. was assigned patent 1,706,194 on a lift truck which has a swivelled steering head with a vertically swinging steering lever. The lever also elevates the frame.

A transmission mechanism for a drilling machine was patented, 1,706,207, and assigned to the Berry Machine Co. The work table is movable up and down.

News of the Week

Foreign Trade Discussed at Baltimore

A RESUME of the conditions and prospects of our markets abroad was made at the sixteenth National Foreign Trade Convention, held at Baltimore, April 17-19. One of the principal addresses was made by James A. Farrell, president of the U. S. Steel Corporation and chairman of the Foreign Trade Council, who sounded a word of warning in the use of the term foreign conquests. He held that nothing could sow the seeds of "pernicious doctrines leading infallibly to economic measures that gnaw at the vitals of sound foreign trade" more effectively than the fashion of regarding commercial advance in a given field as a form of "penetration." "In the fields in which most success has been achieved in our foreign trade, each step forward has been due to the enterprise and efficiency of the sellers and to the aptitude of the buyers and users and their growing need for such things as we are in the best position to supply," he continued. "In no instance has American foreign trade taken the aspect of collective mass action for national purpose."

Canada Our Best Customer

Lynn W. Meekins, American Commercial Attache at Ottawa, spoke on Canadian trade, and said in part: "Canada is our best customer because it needs our products and has ample resources with which to pay for them. It is a close second to the United States in per capita wealth and income. With less than 10,000,000 people Canada's wealth is estimated in the neighborhood of $2,000,000,000. About 3,000,000 Canadians are employed in gainful operations."

Two railroad presidents addressed the convention: Daniel Willard, of the Baltimore & Ohio, and L. A. Downs, of the Illinois Central. Mr. Willard, in discussing efforts of railroads to aid in developing foreign trade, recited the manner in which the Baltimore & Ohio furnished free dockage and pier space at the port of Baltimore to all water lines making use of it as a means of promoting trade. "Prosperity depends upon our ability to keep the greatest number of men gainfully employed by keeping consumption ahead of actual production, of finding markets to absorb our excess products," Mr. Willard told the delegates.

Robert P. Lamont, Secretary of Commerce, in his first public address predicted a bright future for foreign trade of the United States. He brushed aside as a myth the theory that the economic recovery of Europe would tend to stem the leadership of the United States in export trade. He asserted that increased efficiency in production in other parts of the world, instead of cutting down the exports of this country, would increase the buying power of those nations and thus provide wider markets for our goods. He also declared it a great source of satisfaction to see that "more and more of the smaller manufacturers are getting over their inferiority complexes and are contributing in a large measure to our export trade."

Among the detailed subjects discussed were: Installment selling for export, credit insurance as practiced both here and abroad; the relation of advertising to foreign trade; and air transport for commerce. As a demonstration of modern communication, a speech on economic conditions in Germany delivered in Berlin was radioed to Baltimore and amplified so that it could readily be heard by the delegates.

Taylor Society Meeting Postponed Indefinitely

The spring meeting of the Taylor Society, announced in the April 4 issue of the *American Machinist* as being scheduled for May 1 and 2 at Charlotte, N. C., has been postponed indefinitely on account of the generally unsettled state of affairs in the textile industry in the South. Although in some respects the situation makes it a favorable time for the discussion of management on the basis which it is the purpose of the Society to promote, it was deemed advisable to cancel the meeting in order to avoid introducing into the discussion factors of possible misunderstanding, involving the distinction between scientific management and efficiency systems.

Light's Golden Jubilee to Honor Edison

Light's Golden Jubilee is being launched this month in celebration of the fiftieth anniversary of the invention of the first practical incandescent lamp by Thomas A. Edison. The climax of the jubilee will be on October 21, when suitable ceremonies marking the event will take place at Dearborn, Mich., where all of Edison's original laboratories and machines are being assembled by Henry Ford. There the original experiments will be repeated.

Display at Atlantic City

The first climax of the jubilee will take place in early June in Atlantic City at the time of the National Electric Light Association convention, when a city-wide display of modern electric lighting will take place. In October it is expected that many of the larger cities of the United States will take part in the celebration by developing street lighting and floodlighting plans for the event. Aviation will figure in the picture by having numerous planes hovering over the cities with searchlights playing upon them. In Dearborn, particularly, it is expected that a hundred planes will be in the air at one time. A country-wide radio hook-up will be used to broadcast the ceremonies.

During the N.E.L.A. convention at Atlantic City, one day will be set aside as Edison Day, at which time the official plans for the Jubilee will be announced. One of the events will be the dedication of the Edison School of Technology at Dearborn in October.

Westinghouse to Open Lighting Institute

Coincident with the N.E.L.A. convention in Atlantic City and the inauguration of Light's Golden Jubilee in the latter part of May, the Westinghouse Lamp Co. will open the Westinghouse Lighting Institute in Grand Central Palace in New York City as a permanent institute for the advancement of the art of lighting. It is intended to be a working laboratory for engineers, architects and designers seeking the solution of lighting problems. The industrial engineer, for example, may verify his own lighting calculations by actual measurement and observation with the equipment provided by the Institute. The Institute will cover an entire floor, and will have a full-size street, stores, and an industrial building. In this industrial building will be shown modern examples of general lighting and specific applications to typical shop operations, such as heavy press work, lathe work, and bench assembly. An auditorium is also provided for special demonstrations.

Steel Furniture Industry Holds Trade Conference

The first trade practice conference of the steel office furniture industry was held at Washington on April 13 under the auspices of the Federal Trade Commission. Edgar A. McCulloch, Chairman of the Commission, presided. A major portion of the trade was in attendance. Sixteen resolutions were unanimously accepted defining various practices held by the conference to be unfair methods of competition. Among these were rules aimed at various forms of price discrimination, secret rebates, free delivery of goods sold at f.o.b. factory price, etc. The clandestine violation of any of the conference rules also was named as unfair practice. The resolutions are now before the Commission for final approval. All steel office furniture except safes and stock supplies comes within the scope of the agreement.

Employment Situation Becoming Serious

According to Ernest F. Du Brul, general manager of the National Machine Tool Builders' Association, the relative shortage of skilled labor in the metal-working industry is increasing. Some automobile companies continue to advertise for mechanics in machine tool producing centers, such as Cincinnati, Rockford, Providence, and Worcester. This practice has had the effect of stimulating men to leave their jobs in the machine tool building plants, and it tends to reduce the amount of production per man per hour even for the men who stay at work. Because jobs are so easy to get, the mechanics are getting more careless with their work and are slowing down production. In shops where there is a bonus or premium system, this tendency is not so marked as in the straight day-work shops, but there is an increasing tendency toward raising basic wages.

Labor scarcity is today a limiting factor holding back the production of machine tools. If the present rate of activity continues much longer, the effect of the labor scarcity will become more apparent as time goes on. According to Mr. Du Brul, unfilled orders now on the books that are promised for delivery in three or four, and in some cases even five months, are going to cost more than the orders that are going out today, because of this labor difficulty.

Most Unstable in Automobile Plants

The Bureau of Labor Statistics reports that the automobile industry shows the greatest instability of employment of any of the industries so far analyzed in its studies of the subject. Data were obtained from 78 establishments representing all kinds of plants engaged in the manufacture of automobiles, trucks, busses and bodies, but did not include those making accessories and specialties. The average full-time employment in these establishments for the twelve months ending November 1928 is reported to be 80.8 per cent. The range was from a high percentage of 97.1 to a low of 48.3. Only 2.6 per cent of the plants reported an employment stability of 95 per cent and over, while 38.5 per cent of the plants had an employment stability under 80 per cent. Other plants were scattered between these limits.

Chief Object of Mergers Is Better Marketing

The underlying motive for present-day mergers seems to be the search for better markets and marketing conditions rather than the interest of cheaper and more efficient production, according to Professor Willard L. Thorp of Amherst College in a chapter on "The Changing Structure of Industry," forming part of the study of "Recent Economic Changes," prepared by a committee of which President Hoover is chairman. Professor Thorp points out that since 1919 the iron, steel and machinery group has accounted for about one-fifth of all mergers and acquisitions in mining and manufacturing.

Approximately the same tendency was noted in the semi-annual survey conducted by the Association of Business Papers and the National Conference of Business Paper Editors. This survey found that while in former years mergers were chiefly for refinancing purposes, those effected in 1928 and contemplated for the present year have been undertaken rather as a means to find the way out of ruinous competition and to facilitate necessary research development both as to products and markets.

Explains French Attitude Toward U. S. Cars

By Our Paris Correspondent

Criticism in many quarters has led to an unsupported statement which has appeared generally in the French press that the United States was dumping its overproduction of automobiles in Europe. If there is any value to such a statement it cannot however be said to apply to France. What is more probable is that the French makers in general have got to line up with modern production methods as have Citroen and Renault in order to turn out their product at a lower figure. Only then will the manufacturer be able to curtail the march of the American automobile, even in France.

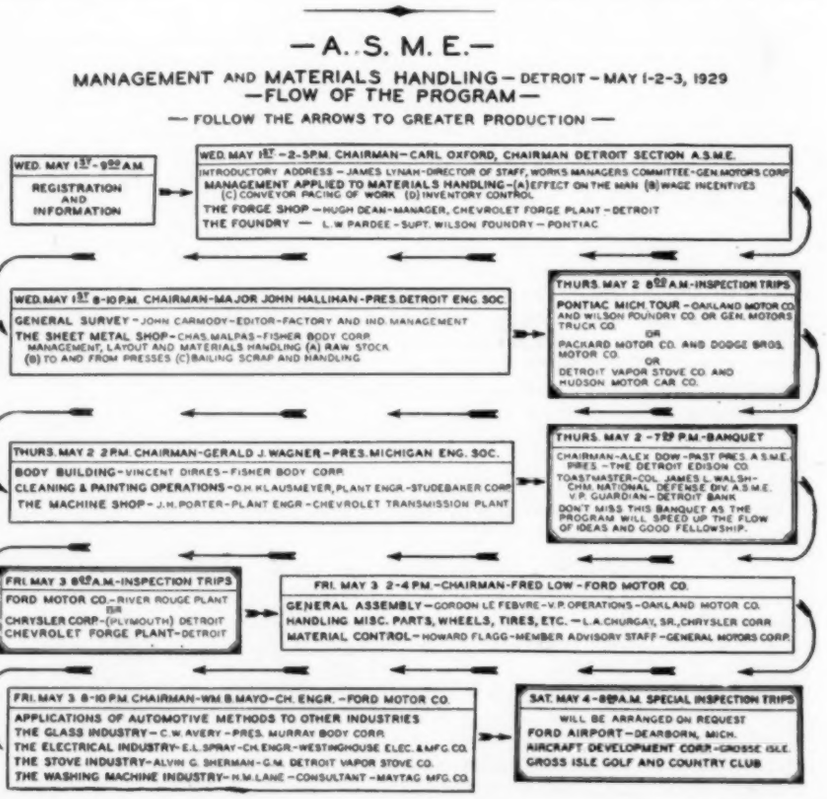
It is to be observed that there is a general acquiring of small precision tools of American origin for automobile repair work by the better garages and machine shops, specifically cylinder grinders and even a well-known American cylinder honing appliance. Proper representation should develop business in such lines but a campaign of education will be necessary to assure a satisfactory volume of business.

Among new American ventures established here is the French Lockheed Hydraulic Brake, with a capital of 4 million francs.

The French industry looks askance at the American invasion of interest in the British and German automobile industries, but rumors of a General Motors infiltration in established French firms is emphatically denied. It is a recognized fact, however, that the French industry needs expansion capital or credit assistance for equipment to cater fully to the potential market.

The luxury tax of 12 per cent inaugurated during the war and still in force is handicapping not only the automobile industry but many other plants producing accessories of modern life. The tax produced 2,300,000,000 francs in 1928, of which the modest man's automobile paid from two to five thousand francs each, reaching as a sum total probably a quarter of the entire tax. The set-back to a buying boom in anything but the most necessary lines is formidable, and protest is heard on all sides. An association has been formed for lobbying the question of its suppression before parliament.

Motor-cycle production has been active and exports in 1928 reached a total value of 22,720,000 francs, an increase of 5 million francs from the year before.


—A. S. M. E.—
MANAGEMENT AND MATERIALS HANDLING — DETROIT — MAY 1-2-3, 1929
—FLOW OF THE PROGRAM—
— FOLLOW THE ARROWS TO GREATER PRODUCTION —
WED. MAY 1ST - 9:00 A.M.
REGISTRATION AND INFORMATION
WED. MAY 1ST - 2-5 P.M. CHAIRMAN - CARL OXFORD, CHAIRMAN DETROIT SECTION A.S.M.E.
INTRODUCTORY ADDRESS - JAMES LYNAH - DIRECTOR OF STAFF, WORKS MANAGERS COMMITTEE - GEN. MOTORS CORP.
MANAGEMENT APPLIED TO MATERIALS HANDLING - (A) EFFECT ON THE MAN (B) WAGE INCENTIVES (C) CONVEYOR PACING OF WORK (D) INVENTORY CONTROL
THE FORGE SHOP - HUGH DEAN - MANAGER, CHEVROLET FORGE PLANT - DETROIT
THE FOUNDRY - L. W. PARDEE - SUPT. WILSON FOUNDRY - PONTIAC
WED. MAY 1ST 8-10 P.M. CHAIRMAN - MAJOR JOHN HALLIHAN - PRES. DETROIT ENG. SOC.
GENERAL SURVEY - JOHN CARMODY - EDITOR - FACTORY AND IND. MANAGEMENT
THE SHEET METAL SHOP - CHAS. MALPAS - FISHER BODY CORP.
MANAGEMENT, LAYOUT AND MATERIALS HANDLING (A) RAW STOCK (B) TO AND FROM PRESSES (C) BAILING, SCRAP AND HANDLING
THURS. MAY 2 8:00 A.M. - INSPECTION TRIPS
PONTIAC, MICH. TOUR - OAKLAND MOTOR CO. AND WILSON FOUNDRY CO. OR GEN. MOTORS TRUCK CO.
OR
PACKARD MOTOR CO. AND DODGE BROS. MOTOR CO.
OR
DETROIT VAPOR STOVE CO. AND HUDSON MOTOR CAR CO.
THURS. MAY 2 2 P.M. CHAIRMAN - GERALD J. WAGNER - PRES. MICHIGAN ENG. SOC.
BODY BUILDING - VINCENT DIRKES - FISHER BODY CORP.
CLEANING & PAINTING OPERATIONS - O. H. KLAUSMEYER, PLANT ENGR. - STUDEBAKER CORP.
THE MACHINE SHOP - J. H. PORTER - PLANT ENGR. - CHEVROLET TRANSMISSION PLANT
THURS. MAY 2 - 7:00 P.M. - BANQUET
CHAIRMAN - ALEX DOW - PAST PRES. A.S.M.E. PRES. - THE DETROIT EDISON CO.
TOASTMASTER - COL. JAMES L. WALSH - CHM. NATIONAL DEFENSE DIV. A.S.M.E. V.P. GUARDIAN - DETROIT BANK
DON'T MISS THIS BANQUET AS THE PROGRAM WILL SPEED UP THE FLOW OF IDEAS AND GOOD FELLOWSHIP.
FRI. MAY 3 8:00 A.M. - INSPECTION TRIPS
FORD MOTOR CO. - RIVER ROUGE PLANT
OR
CHRYSLER CORP. - (PLYMOUTH) DETROIT
CHEVROLET FORGE PLANT - DETROIT
FRI. MAY 3 2-4 P.M. - CHAIRMAN - FRED LOW - FORD MOTOR CO.
GENERAL ASSEMBLY - GORDON LE FEBVRE - V.P. OPERATIONS - OAKLAND MOTOR CO.
HANDLING MISC. PARTS, WHEELS, TIRES, ETC. - L. A. CHURCHILL, SR., CHRYSLER CORP.
MATERIAL CONTROL - HOWARD FLAGG - MEMBER ADVISORY STAFF - GENERAL MOTORS CORP.
FRI. MAY 3 8-10 P.M. CHAIRMAN - WM. B. MAYO - CH. ENGR. - FORD MOTOR CO.
APPLICATIONS OF AUTOMOTIVE METHODS TO OTHER INDUSTRIES
THE GLASS INDUSTRY - C. W. AVERY - PRES. MURRAY BODY CORP.
THE ELECTRICAL INDUSTRY - E. L. SPRAY - CH. ENGR. - WESTINGHOUSE ELEC. & MFG. CO.
THE STOVE INDUSTRY - ALVIN G. SHERMAN - G.M. DETROIT VAPOR STOVE CO.
THE WASHING MACHINE INDUSTRY - H. M. LANE - CONSULTANT - MAYTAG MFG. CO.
SAT. MAY 4 - 8:00 A.M. SPECIAL INSPECTION TRIPS
WILL BE ARRANGED ON REQUEST
FORD AIRPORT - DEARBORN, MICH.
AIRCRAFT DEVELOPMENT CORP. - GROSSE ISLE
GROSS ISLE GOLF AND COUNTRY CLUB

Russia Still a Big Outlet for German Machinery

By Our Berlin Correspondent

IN VIEW of the serious disturbances in German-Russian trade relations that occurred last year, it is interesting to analyze German machinery exports to Russia, now that the German Bureau of Statistics has completed export returns for 1928. The criminal proceedings against German engineers engaged in setting up machinery on behalf of German manufacturers are still in everybody's memory. The true inside story has never been disclosed in full, but from what transpired it may be concluded that the cordial relations existing between German industry and the Russian Commissariat of Trade have suffered a marked reverse. The A.E.G. Electrical Co., perhaps the pioneer of German trade in re-awakening Russia, has signally withdrawn its staff of agents and engineers from Russia, and other firms have followed suit. Besides, the financial side of the transactions has caused a good deal of friction. Payments withheld on the ground of alleged deficiencies in the products supplied were the order of the day. The consequence was that German manufacturers withdrew from active co-operation in installations and fell back upon treating Russian business on the customary export terms, cash and assumption of full responsibility for the goods supplied on delivery.

Machinery Trade Exempt From Decline

The greater part of last year's business turnover was transacted on those terms, and, seeing what extraordinary facilities had been extended to the Russian market in the preceding year, a sharp decline of business was bound to ensue. Peculiarly enough the German-Russian machinery trade was exempt from the decline. It is true that a great number of promising negotiations fell to the ground and that most likely, if nothing untoward had happened, the turnover of the machinery trade with Russia in 1928 would have run up to record figures, but it is also a fact that the part of it that materialized compares quite well with that of the year before, when the commercial *entente cordiale* between Germany and Russia was at its best.

Those commenting upon this fact usually maintain that Germany is and will remain Russia's best source for many classes of machinery and that she will always get a substantial share of Russian purchases. German manufacturers are wont to console themselves with this hope the more readily because many other hopes have been shattered and because the Russian market has, all in all, been a disappointment. The sorest experience made with it is no doubt its lack of the one quality so cherished with exporters: continuity of business. It is spasmodic with its orders and noticeably erratic. Manufacturers having done their utmost to render satisfaction can never be sure of seeing a second order. Moreover, whole fields of machine building will be overrun with Russian inquiries one year and be neglected the next.

A comparison of the accompanying figures giving German machinery exports to Russia in the last three years appears to corroborate this experience.

German Machinery Exports to Russia for the Past Three Years

	1928	1927	1926
	Tons		
Railway engines and tenders	405	262	...
Tractors	226	844	422
Steam engines (stationary and portable)	354	871	300
Steam turbines	1,879	185	103
Motors for vehicles (chiefly Diesel)	130	83	23
Stationary combustion motors	2,646	340	149
Compressors	...	...	192
Cranes	1,287	1,769	246
Power machinery combined with dynamos and conveying machinery	2,646	1,730	375
Dredgers	319	890	338
Sewing machines	102	45	46
Knitting machines	107	87	85
Spinning machinery	2,055	2,262	3,167
Weaving machinery	211	313	100
Other textile machinery	194	233	...
Cloth dressing machinery	530	585	396
Pumps	2,667	2,463	795
Metal-working machine tools	14,534	17,961	5,821
Woodworking machinery	935	1,065	531
Power plows	645	335	414
Threshers	437	2,969	3,394
Mowers	...	993	7,776
Cultivators	906	1,333	1,206
Other agricultural machinery	183	...	62
Cream separators	...	19	41
Grain mills	96	136	...
Rock drilling machinery	114	490	143
Pneumatic tools	19	40	...
Paper machinery	6,802	1,623	442
Refrigerators	219	262	...
Elevating machinery	3,514	2,509	337
Book binding machinery	227	230	185
Ore dressing machinery	3,722	2,641	332
Blowers, ventilators	297	1,038	196
Leather and shoe machinery	260	251	494
Ceramic machinery	2,345	2,694	366
Printing presses	448	934	487
Others	3,616	3,961	2,066
Parts	7,061	7,364	3,348
Laundry machinery	...	63	86
	62,158	61,873	34,464

Unusually sharp fluctuations are seen in it and a certain steadiness is noticeable only in a few cases, chiefly the minor ones.

A typical instance is that of Diesel motors. In 1927 Russia bought 154 tons of this class of engines; in 1928, 1,669 tons or more than eleven times more. In the case of steam turbines the sudden rise is still steeper. On the other hand, the sales of agricultural machinery have dropped considerably in the three last years. Their total amounted in 1926 to 12,850 tons, in 1927 to 5,630 and in 1928 to 2,171 tons. Mowers, of which in 1926 no less than 7,776 tons were sold to Russia, are entirely absent in the list of last year.

Machine tools have nearly kept their own in 1928, compared with the preceding year, but a decline is quite noticeable. From the trend of current business it must be assumed, that this decline will be continued at an accelerated pace.

The same applies to most other classes of machinery. In fact, when a scrutiny of the sequence of monthly returns is made, it can be clearly recognized that the middle of 1928, at about which time the German-Russian commercial friction took effect, marks a turning point. Up until the end of June, 1928, 35,000 tons of machinery were exported to Russia; in the second half of that year only 25,000 tons. In 1927 the reverse order prevailed. The total of the first half of the year amounted to 23,000 and that of the second half to 38,000 tons.

All in all, the prospects are far from roseate. German manufacturers have discovered disadvantages in Russia's central buying organization. They were well versed in the old time Russian business methods, but can make nothing of the present ones. Apart from the keen competition deliberately fostered by the Russian buyers, the "playing-one-against-the-other" system, the chief drawbacks are seen in red tape practice, reluctance of the buyers to take responsibility, their erratic procedure, and very often the exceptionally hard terms imposed.

Very frequently the plan of a uniform battle front against Russia has been contemplated, involving selling trusts in the various branches of manufacture as opposed to the central buying organization of Russia, but the idea was always given up for fear of retaliation.

Woodworking Machinery Study to Be Made

At the request of the National Association of Wood Turners, Inc., and the Association of Manufacturers of Woodworking Machinery, the Domestic Commerce Division of the U. S. Department of Commerce is undertaking a study of machinery used in the woodturning branch of the woodworking industry. This is the second study in the Division's industrial equipment survey of which the Philadelphia knitted outerwear machinery study is the first. The purpose of the present study is to determine the extent to which the more profitable machines are being used. It will cover analysis of the types of machinery in use in woodturning plants and of the development and improvement of those types among machinery manufacturers. Data on such points as will measure the profitableness of given types of machines of various ages under the same conditions will be collected so as to determine the added expense involved in continuing to use machines that are obsolete.

Following a preliminary study of one or two plants in the Middle West, selected woodturning plants in New England will be taken up for intensive analysis. Most of the facts will be collected by means of a questionnaire.

BUSINESS BAROMETER . . . . *While there has been no general contraction in business, enthusiasm has been chilled, and comparative quietude is in prospect*

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

EVEN the tyro in the study of psychology knows that the crowd is disposed to interpret current developments in accordance with its preconceptions or emotional conditions. It is only necessary to call attention to the fact that stocks and commodities sometimes advance on developments that appear to be bearish, only to decline again on news that seems unmistakably bullish.

The reason for this paradox is to be found in what is called the psychology of the market, a factor that must be recognized and allowed for. These observations are prompted by the quieter tone that was in evidence in the security markets last week, and the declines that have been registered in many commodities, despite a slight recession in interest rates, the prospect of further gold imports, and the statistical revelation that the business turnover during the quarter just ended was the largest in our history.

The reason for this change of attitude is not entirely clear, but there are several possible explanations. Some attribute it to the feeling that Congress will be slow to act upon farm relief and the tariff, and that the procrastination in prospect will be wearisome to both investors and speculators.

Others, including most of the professional forecasters, point out that business activity is now at its peak, and that the seasonal decline which will shortly set in will probably be more marked than usual because some industries overproduced during the first quarter.

And a third and final reason is the continuing verbal warfare that is being waged over the Federal Reserve System's policies. The outcome of the discussion will probably be negligible in that no change will be made in Reserve policies or rates for some time to come. But in the circumstances speculators are wary and disposed to take shelter in case the battle turns against them.

Hence there has been a substantial falling off in the business handled on the Stock Exchange, and those who ought to know insist that we have finally reached a stage at which the selling slightly exceeds the buying.

This has been true not only of the stock market, but of most commodity markets. Copper has declined fully 6 cents a pound from the top. The cotton market has also shown a reactionary tendency. Rubber and sugar are again easier under the weight of excessive stocks, and the grain markets have been fitfully weak from day to day on the good crop outlook and the uncertainty that the Congressional session has cast over speculation.

All of these commodities except copper are sufficiently cheap to justify hope of recovery, as in cotton and grains the early crop promise is succeeded by the inevitable "scares," and in rubber and sugar the low price accomplishes the absorption of the stocks before anyone realizes it. But at present silk, in which good grades appear scarce, is about the only exception to the downward trend among the speculative staples and expectation of a general inflationary advance in commodities apparently must be postponed until there is a change in the credit situation and optimism is revived.

This is not to say that there has yet been any general contraction in business, but it is undeniable that enthusiasm has been chilled and a comparative quietude in all lines seems to be in prospect.

In the reviews of individual trades expectation of early industrial recession is now expressed. Thus an automobile journal says some decline may be looked for before the second quarter is ended and that it is practically certain the output for the third quarter will drop behind the corresponding period of last year. And *Iron Age* says incoming business in finished steel is no longer equal to shipments except in the Chicago district. Tire production already has fallen off and building is still behind though it seems to be picking up.

A recession is inevitable and salutary after the establishment of new records of production during the first quarter. It is commonly believed that the factories of the United States have a capacity to produce 25 per cent more goods than our annual needs, and as the National Association of Manufacturers says they are working at an average of 85 per cent of capacity, over-production must result unless there is an early adjustment. Cycles have not yet been entirely ironed out, as some believe, although they may not reach the extremes they have in former periods.

In the credit situation the most important news is the release of another $13,500,000 of gold in New York which had been earmarked for export. This raises our total imports since the first of February to almost $100,000,000 and there is little indication that the movement will be stopped unless foreign banks embargo gold shipments, support the exchange value of their currencies, or raise their bank rates still higher. Meanwhile the Reserve Banks' holdings of acceptances and government securities—the sale of which would offset gold imports—are declining to almost the irreducible minimum. It is not unthinkable that money may soon be easier even if the securities markets continue to demand their present accommodation.

At all events the gold movement is worth watching, for heavy imports would justify a confidence in the outlook for autumn which is now somewhat lacking.

A GOOD demand for machine tools and machinery is still noted all over the country, although a slight recession is indicated in the New England and Cleveland districts. In both of these cases, however, a healthy volume of orders is being received. After a record-breaking quarter and with the delivery situation as bad as it is, it is evident that many of the tool builders would welcome a breathing spell at this time. Although local dealers in general report that deliveries are daily becoming longer, the official report of the National Machine Tool Builders' Association contradicts this notion. The index of orders for March was below that of February, but a noticeable increase in shipments was made during the month, reflected in an improvement in the ratio of unfilled orders to shipments. The backlog of orders in March was 60 days, as compared with 80 days in February.

EVERYWHERE buying is well distributed, and most orders are for one or two items, generally for replacement purposes. New business in one center at least, Detroit, is coming from small tool shops that have sprung up in that section. These shops anticipate business farmed out by the automotive builders, all of whom are working at capacity. Used equipment, particularly rebuilt modern machinery, is finding the best market in years, due to the long delivery schedules on new tools.

RAILROAD buying appears to be on the increase. Lists issued in New England and New York give promise of future business, and while closing on earlier inquiries is slow in Chicago, further inquiry is expected. In Philadelphia the railroad situation is still considered uncertain.

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The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

DETROIT

The machinery and machine tool trade in the Detroit area has undergone little or no change in the past two or three weeks. There is still a large and regular volume of orders, and there is every indication that the high level of sales will be maintained at least for the immediate future.

There seems little of a spectacular nature in immediate prospect and nothing very big has happened for the past few weeks. Most dealers have characterized the present situation as an extremely healthy one. Orders are mostly for replacement equipment and this is generally considered a sign of substantial development and of industrial poise and stability.

Almost without exception the motor and accessory manufacturers are in heavy production, and all of them are in the market for equipment of some kind or other. Many new tool shops are still starting up and the old ones are nearly all prospering.

Among the automobile manufacturers the present trend of buying is toward labor-saving machinery, and a great deal of this sort of equipment has been sold within the present year. The machinery business thus far in 1929 is about 20 or 25 per cent ahead of last year in many lines.

CHICAGO

Business in machine tools continues on a high level, and the indications as gleaned from several sources point to a total volume of trade this month fully equal to that of March. Demand is widely scattered as to territory, and diversified with respect to buying. While no new lists of importance are reported to have been sent out by large industrialists, and most inquiries are for single tools and small lots, it is said that new inquiries may soon be looked for from builders of farm machinery and tractors for additional shop equipment. This applies particularly to the International Harvester Company.

Electrically-operated small tools are having a steady and active sale, manufacturers' representatives reporting that there has been no let-up in demand since the beginning of the year.

The situation with respect to railroad buying remains unchanged, closing on old lists being slow. It is reported on good authority that the Union Pacific, which thus far this year has not been heard from, will shortly enter the market with inquiries covering a number of tools. Business in used tools continues brisk, but prices asked in many cases for desirable units are declared to be so high as to operate adversely in the closing of sales.

MILWAUKEE

With most metal-working equipment manufacturers running at top speed and employing night shifts in an effort to execute orders in hand, the procurement of new business still is a matter of lesser concern than the production problem. At the same time, new business is being offered in practically undiminished volume and the sales curve shows no sharp peaks or valleys in its day by day progress. Inquiry is of a character that points to continued good demand for many weeks to come.

Orders for single machines or a few items constitute the bulk of new business, and inquiry as a rule does not reflect much large lot business. Buyers are interested in obtaining quick delivery and have been doing considerable shopping, only to find that the delivery situation is uniformly unfavorable. Prospects for early relief are none too good, as it is practically impossible to procure skilled machine shop labor. Usually such a situation has resulted in a large turnover of labor, but in Milwaukee it is reported to be about the lowest that the metal-working industry has known. The classified advertisement pages of local newspapers contain an unusually large number of "Help Wanted" items, principally machinist and tool makers.

The inability of shops to make prompt deliveries has been a boon to the used machinery market. While replacement business has been heavy and dealers have been receiving much used equipment, the demand is such that stocks are in most cases below the average.

CINCINNATI

A good demand in the past week, with very little variation from the previous week, is reported by machine tool manufacturers of the Cincinnati district. Local sales agents report that in the period they made a slight gain in sales and developed an increased number of prospects.

The sustaining feature of the week's market was the sale of single tools to general machinists and miscellaneous users. Orders booked came from all sections of the country and were well diversified in the matters of sizes and types. One good-sized railroad order was reported and there were also several orders for single tools from this market. A small amount of buying was done by automobile manufacturers and concerns in allied trades, the great majority of the orders being for single items.

Inquiries flowed in freely during the week from all sections of the country. Several inquiries were reported as having been received from railroads, but with one exception these were small. Inquiries from the automotive field were largely confined to single tools.

Manufacturing conditions are in every way favorable and the consensus is that the demand will sustain production at a good level for an indefinite period.

CLEVELAND

Sales of machine tools and machinery dropped off slightly during the past two weeks. A spotty condition prevails; declines in sales are reported by a few sources, while others state sales are on a level with the previous ten days, which also showed a decline. Although April will not measure up to February and March in volume of sales, business for the month is expected to be satisfactory. Inquiries are also on the decline.

Buying has been limited to one and two pieces. Automobile plants and general industrialists lead in the buying. Rubber tire manufacturers made recent purchases. The Wheeling and Lake Erie R.R. is buying piecemeal of its large list that was issued around the first of the year. The Great Lakes Aircraft Corporation, recent recipient of a two-million dollar plane order, is planning plant expansions and retooling. The Midland Steel Co. expects to close a contract with a Western railroad for a large car order and will duplicate its present plant and equipment when the deal is consummated. The Foote-Burt Co. will discontinue the manufacture of washing machines to make possible increased production of drilling, boring and tapping machines.

The used tool market is enjoying good business, this condition being due to the inability of tool producers to guarantee early deliveries on new tools.

NEW ENGLAND

The first half of April has about equalled the order volume of the last half of March. Many orders for machine tools were received in the New England section, but there is evidence of a decline from the corresponding half of March. The current week has maintained the level of business characteristic of the month thus far, and indicates the assumption of a steady and healthy order distribution, though somewhat below the tremendous business rush that made the first quarter of 1929 a record breaker in New England.

New business during the week seems to have been limited for the most part to orders for single tools. Instances of price advances have not deferred inquiries, which in the past week have shown excellent promise and included a large list from an Eastern railroad. New England railroad interests have thus far confined 1929 buying of machine tools to an occasional replacement unit. But there is now promise of better business from this source later on. It is seen in plans of the Boston & Maine R.R. for engine houses and shops at Somerville, the construction and equipping cost of which may reach a million dollars.

Small machine shops are a prominent construction item and become more and more a factor in the buying market of the metal-working industry. Acute demand for quantity production at highest speed and quality has created keener competition, and these small companies are realizing more fully the value of equipping with the newest and most modern units available, and are buying accordingly.

NEW YORK

The situation in the machine tool market in the Metropolitan area continues brisk, with no indication of slackening. Inquiries are good, followed in most cases by quick buying upon receipt of quotations. Delivery is still the big problem, with all manufacturers reporting stocks depleted and plants working overtime in the attempt to keep up with orders. However, deliveries continue to move back. On most standard lines of machines, July and August are the earliest dates promised. Some run to October. On special equipment, built only on order, a few deliveries are dated for the first of next year. Small tools are a month or more behind normal in delivery.

Prices are almost certain not to drop. Some concerns have announced increases; others may do so shortly. This upward trend is but natural, considering the many recent improvements introduced into most makes of machine tool equipment. The trend of demand is toward the more complex designs, buyers showing a decided leaning toward purchases on the basis of what the equipment will do in the way of increasing production and lowering unit cost.

Business is split between expansion of plant capacities, which explains less than half of the increase, and replacement of obsolete equipment, which the user can no longer afford to run. Replacements due to

worn-out or broken machinery form only a small fraction of the demand. There is much more general buying than in previous years, and much less seasonal business.

The used machinery industry reports that equipment is moving fast. Stocks are running low and deliveries are falling back. April shows a big jump in volume over March and perhaps the increase will go beyond 50 per cent. This condition reflects in part, the inability of buyers to get quick deliveries on new equipment. Prices hold up, especially on the more modern makes of used machinery.

Buying of new machine tools both large and small types, is well spread. Quantity orders are in prospect or have been placed from two electrical manufacturers, an electric accessory concern, one of the larger metal-working plants moving into a new building, and the Delaware, Lackawanna and Western Railroad. In general, however, orders are for one or two machines from each concern, with small as well as large plants buying, and with practically every industry on the list of purchasers. Small tools are moving briskly and in unusual volume, as well.

The following list of sales of the Triplex Machine Tool Co. is representative of the buying trend: one Swiss jig borer, one 24-in. Springfield lathe, two Fitchburg spline grinders, two bench drills, one No. 1A Campbell nibbler, two flexible shaft machines, and an Ames bench miller.

PHILADELPHIA

Sales of machinery and machine tools in this market continue to be of a substantial nature, covering a well scattered area and representing a diversified list of industries. A noticeable feature of sales during the last two weeks was the purchases of shop equipment by machine tool producers themselves. These sales consisted largely of lathes and drill presses.

There has been some business transacted in this market with firms producing equipment for aircraft, and some radio business. Automobile manufacturers have not been active in the market, reports indicated, although one dealer reported some inquiries from that source.

There have been some inquiries for industrial machinery from the Middle West and some from the East. The situation with reference to the railroads is still uncertain. The roads that dealers here believe are now the most hopeful for early purchases appear to be the Chesapeake & Ohio and the Delaware, Lackawanna & Western. Business on the whole has been such as to warrant the belief that sales will continue for some time on a substantial level.

BUFFALO

The first quarter's business in the machine tool and electrical equipment trade here was perhaps the best quarter-year business ever enjoyed. At least it proved to be the best quarter in a good many years. Because of the hand-to-mouth buying and manufacturing during the last eight or nine years, the inevitable result of the advance in business has been to delay deliveries and, in some instances, to raise prices. The latter is particularly true in the electrical equipment field. But advances in the machine tool line run as high as 12 per cent.

Collections are uniformly good. One house reported them to be the best in many months. Buying is widely distributed, small firms as well as large ones being active purchasers. Except the airplane industry, no other leads in purchases. While the Curtiss Aeroplane & Motor Co. has practically completed the purchase of equipment for its new plant, other aircraft makers have come into the market, notably General Airplanes Corporation. It is interesting to note the Elias aircraft group has been reorganized and new capital added to the business will be expended for a new plant contiguous to the Buffalo Airport. This will take much new equipment.

It has also been announced that Arthur B. Harrison and Charles A. Harrison, sons of the late Herbert C. Harrison who founded the Harrison Radiator Co., will build a new radiator and heating system plant in Lockport known as the Multicell Radiator Corporation. Several other companies in western New York are building new plants and expanding facilities.

The market for contracting equipment is weak and will doubtless continue to be as long as the inclement weather continues.

Robbins & Myers Form Crane & Hoist Division

Robbins & Myers, Inc., Springfield, Ohio, have created a crane and hoist division using the executive, technical and sales personnel formerly associated with the Chisholm-Moore Manufacturing Co., of Cleveland. The line includes electric and hand-power cranes, hoists and trolleys up to 10-ton capacity, and has been improved throughout. Frank F. Seaman has been appointed general manager of the Robbins & Myers Crane and Hoist Division. Since 1902 he has been engaged in the design, manufacture and sale of hoisting machinery with the Sprague Electric Works, the Yale & Towne Manufacturing Co., the Toledo Bridge & Crane Co., the Euclid Crane & Hoist Co., and Chisholm-Moore. Carl E. Schirmer, chief engineer of the division, was formerly assistant engineer of the material handling divisions of both the Union Pacific R.R. and the Schaffer Engineering Co. He has also been chief engineer of the Toledo Crane Co. and of Chisholm-Moore.

Sales will be in charge of John R. Mears, and Albert Kreh, William J. Scott and John J. Becker will be district sales managers for New York, Chicago and Detroit, respectively.

Business Items

The L. S. Guetti Tool Co. has been formed with a manufacturing plant in Indianapolis, Ind. The company was organized by L. S. Guetti, formerly of the Haynes Stellite Co. of Kokomo, Ind. Mr. Guetti has had 29 years experience in the tool business. He has been with the National Tool Co., of Cleveland, the Greenfield (Mass.) Tap & Die Co., the Union Twist Drill Co. of Athol, Mass., and the Haynes company as chief inspector and chief tool supervisor. Besides Mr. Guetti as president and general manager, other officers of the company are Henry Maroni, secretary and treasurer, and D. S. Rivers, sales manager. Production of all kinds of high-speed cutting tools and Stellite gages will be begun at once. The company is also agent for the Jessop Steel Co. and the Coats Machine Tool Company.

The Carboloy Co., Inc., of New York, has appointed the following branch managers and has opened offices at the addresses given: A. A. Merry, Engineers Bank Bldg., Cleveland; W. W. Fullagar, 11 S. La Salle St., Chicago; W. G. Robbins, 2481 E. Grand Blvd., Detroit; W. G. Lane, 316 N. Beachwood Drive (Home), Los Angeles, Calif.; and W. J. Lindner, 350 Madison Ave., New York.

The Central Alloy Steel Corporation, Massillon, Ohio, is carrying out a program of improvements involving the expenditure of about $1,000,000. A large part of this sum will be devoted to developing a plant for the manufacture of the new Krupp Nirosta stainless alloys. Included in the improvements is an induction reclaiming furnace for reclaiming steel scrap without the loss of chromium and nickel.

The Pacific Electric Manufacturing Corporation, of San Francisco, has opened an eastern branch assembling plant and warehouse at Gary, Ind. All products sold east of the Mississippi will be handled from Gary. Sales will be under the supervision of C. F. Lomont. The Gary plant will be in charge of E. S. Kessler, former executive engineer at the San Francisco home office.

The Floral City Heater Co., Monroe, Mich., has suspended operations. This firm has been engaged in the manufacture of furnaces, boilers and in foundry jobbing for the automotive and other industries. The death of William P. Cooke, general manager, last month has seriously upset the business and the directors are undecided whether or not the suspension will be made permanent.

The Minneapolis (Minn.) Steel & Machinery Co. and the Moline (Ill.) Implement Co. have merged to form the Farm Implement & Tractor Manufacturing Corporation, with total assets of over $30,000,000. The executive and administrative offices of the new corporation will be in Minneapolis.

The Meadows Manufacturing Co., Bloomington, Ill., has completed installation of $75,000 worth of machinery and has arranged for daily operation of 22 hours to meet production demands. It has increased its force to 400. The company makes the "Select-a-Speed" washing machine.

The Pratt & Whitney Aircraft Co., Hartford, Conn., has released a financial report for the first quarter of 1929, and shows net profits of $1,300,274. This is an increase of about $1,000,000 over the corresponding period of 1928.

Although the upper stories are still uncompleted, machinery is being moved into the large new Packard plant in Detroit. The building is being erected alongside of the main plant. It is five stories high and contains 300,000 sq.ft. of floor space.

Ground will be broken this week for a much-needed extension to the plant of the Carlton Machine Tool Co., Cincinnati.

Personals

DR. JULIUS KLEIN, director of the Bureau of Foreign and Domestic Commerce of the U. S. Department of Commerce, has been nominated Assistant Secretary of Commerce by President

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Hoover. He will succeed Walter F. Brown, the present Postmaster General, who resigned from the Commerce Department to further Mr. Hoover's candidacy for president. Dr. Klein has just recently returned from a tour of Europe, where he has been studying the economic conditions of the various countries with a view of developing U. S. trade there. He has contributed a number of articles to the *American Machinist* analyzing conditions in both Europe and South America.

T. S. CATMUR has resigned the managing-directorship of Burton, Griffiths & Co., Ltd., London, England, after a connection extending over about 30 years. He joined the firm when the staff was about half a dozen, was appointed manager in 1903, was with E. M. Griffiths co-director when the firm was formed into a limited company in 1913, and was appointed managing-director in 1923. His address is Stuckley, Elstree Hill, Bromley, Kent. His successor is Arthur Andrews, of the Andrews Machine Tool Co., Birmingham, this business having been acquired by the Birmingham Small Arms Co., Ltd., who are also interested in Burton-Griffiths & Co., Ltd.

WILLIAM C. DICKERMAN, vice-president of the American Car and Foundry Co., has been elected president of the American Locomotive Co., succeeding William H. Woodin, president, chairman and leading stockholder, who resigned in his favor. Mr. Woodin, however, will retain his position as chairman of the board, and president and director of American Car and Foundry. Since his graduation from Lehigh University in 1896 Mr. Dickerman has had a broad industrial experience. In 1905 he was elected vice-president of the American Car and Foundry Co. and in 1919 he was placed in charge of operations, in which capacity he has since served.

E. M. HAMMER, vice-president and general manager of the Defiance Machine Works, Defiance, Ohio, will sail on the *S. S. Aquitania* on May 8 for a two-month trip on the Continent in the interests of the company. Several weeks will be spent in Russia supervising the installation and operation of a complete plant of Defiance machines for building farm wagons sold to the Soviet government through the Amtorg Trading Corporation, New York.

ROY E. COLE, formerly chief engineer of Dodge Brothers, Inc., has been made chief engineer of Durant Motors, Inc. HAROLD NUTT, assistant chief engineer, has been transferred from the Elizabeth, N. J., plant to Detroit. GEORGE H. ROBINSON, supervisor of experimental work and tests, has also been transferred from Elizabeth to Detroit.

GORHAM C. PARKER, secretary and manager of the Stockbridge Screw Co., of Stockbridge, Mich., has purchased the Rochester (Mich.) Metal Products Co., manufacturer of an extensive line of screw machine products, and will direct the affairs of both companies.

G. LARUE MASTERS has been made sales manager of the National Lock Washer Co., Newark, N. J., manufacturer of "Hipower" spring washers for railroads; "Kantlink" spring washers for general industrial applications; forgings, and miscellaneous equipment.

M. DES CHAMPS of Brussels, Belgium, has arrived in Anderson, to have charge of manufacture of the Renard aeroplane motors for the Wright-Tuttle Co. of Anderson, Ind. Manufacture of these motors will start about May 1.

CHARLES STROM, formerly with the Fisk Tire & Rubber Co., has joined the export sales department of the Black & Decker Manufacturing Co., Towson, Md., and will represent the company in foreign markets.

S. H. TRUITT, assistant district sales manager of the Philadelphia office of the Central Alloy Steel Corporation, of Massillon, Ohio, has been appointed sales manager of that district.

WILLIAM K. WAYLAND, general superintendent of the Wagner Malleable Iron Co., Decatur, Ill., has resigned and has become plant superintendent for the Illinois Malleable Iron Co. at Chicago.

FRANK R. WILLIAMS has joined the sales force of Gears and Forgings, Inc., in the Buffalo territory. He will devote most of his time to the sale of speed reducers.

J. W. WOLFE, formerly with the Hoover Co., North Canton, Ohio, has been appointed chief engineer of the Oesterlein Machine Co., Cincinnati.

C. A. WILLIS, formerly general shop superintendent of the William B. Pollock Co., Youngstown, Ohio, has been made general manager of the company.

A. C. COOK, vice-president of the Warner & Swasey Co., Cleveland, sailed Saturday, April 20, for Europe. Mrs. Cook accompanied him.

Obituaries

GEORGE MEAD, president of the Mead Machine Co., Monroe, Mich., was killed in an automobile accident in Monroe on April 18. Mr. Mead, who had had wide experience in the field of motor and parts manufacture, recently re-organized the business, brought in a large amount of new capital and concluded plans for greatly increased production. The company had obtained a large number of orders for marine engines, gasoline motors, lubricators and other machinery and equipment. Mr. Mead was at one time plant superintendent of the Van Blerck Motor Co. at Monroe. He served also as production superintendent of Standard Steel and Bearings Co., Plainville, Conn., manufacturing manager of the Ace Motor Corporation in Philadelphia, toolroom foreman of the Chicago Foundries Hardware Co. and experimental man for the Pfanstiehl Electrical Laboratories.

WILLIAM HARTY, for many years president of the Canadian Locomotive Co., died on April 1 at his home in Kingston, Ontario, at the age of 82.

Forthcoming Meetings

AMERICAN WELDING SOCIETY. Annual meeting, April 24-26, at the Engineering Societies Bldg., New York. M. M. Kelly, secretary, 29 West 39th St., New York.

AMERICAN MANAGEMENT ASSOCIATION. Annual meeting, Hotel Pennsylvania, New York, May 7. W. J. Donald, managing director, 20 Vesey St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Eastern Spring meeting, Rochester, N. Y., week of May 13. Third national meeting of the aeronautic division, St. Louis, Mo., May 27-30. Semi-annual meeting, Salt Lake City, Utah, July 1-4. Third national meeting of the Iron and Steel Division, during the Steel Treaters' Exposition, Cleveland, September 11-13. Calvin W. Rice, secretary, 29 West 39th St., New York City.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION. Thirteenth annual meeting to be held in the Hotel Statler, Cleveland, Ohio, May 16-18. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, June 24-28, at the Chalfonte-Haddon Hall, Atlantic City, N. J. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

SOCIETY OF AUTOMOTIVE ENGINEERS. Summer meeting, Saranac Inn, Upper Saranac Lake, N. Y., June 25-28. Coker F. Clarkson, manager, 29 E. 39th St., New York.

The Weekly Price Guide

Rise and Fall of the Market

THERE is a strong upward tendency in current prices of finished steel, semi-finished material and scrap. In the pig-iron market, however, the price movement is upward in the Mahoning and Chenango valleys and downward in Alabama. A price of $1.95 per 100 lb. for steel shapes and plates is being firmly held at Pittsburgh for large mill lots. The quotation of $1.90, which prevailed from October, 1928, to March, 1929, inclusive, has finally disappeared from the steel market. Sharp reductions are noticed this week, compared with last, in prices offered by dealers for scrap non-ferrous metals. In raw metals, the principal changes of the week were a reduction of 1c., to 51c. per lb. in Straits tin and ⅛c., to 8½c. per lb. for pig lead, at New York warehouses. Zinc sheets, on the contrary, are up ¼c. to 10½@11c. per lb.

(All prices as of Apr. 19, 1929)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$18.94
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 1.75@2.25)	24.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	15.50@16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	21.26
PITTSBURGH, including freight charge ($1.75) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.25	3.90*
No. 12	2.15@2.25	3.40	3.30	3.95*
No. 14	2.25@2.35	3.45	3.35	4.00*
No. 16	2.35@2.45	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.65@2.75	3.60	3.50	3.80
No. 22	2.80@2.90	3.75	3.65	3.95
No. 24	2.85@2.95	3.80	3.70	4.00
No. 26	2.95@3.05	3.90	3.80	4.10
No. 28	3.10@3.20	4.50	3.95	4.25
Galvanized				
No. 10	2.80@2.90	3.95	3.85	4.05
Nos. 12 to 14	2.90@3.00	4.05	3.95	4.15
No. 16	3.00@3.10	4.15	4.05	4.25
No. 18	3.15@3.25	4.30	4.20	4.40
No. 20	3.30@3.40	4.45	4.40	4.55
No. 22	3.35@3.45	4.50	4.45	4.60
No. 24	3.60@3.70	4.65	4.55	4.75
No. 26	3.75@3.85	4.90	4.80	5.00
No. 28	4.00@4.10	5.15	5.05	5.25

*Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

Thickness—Decimal Fractions	B.w.g. and	Outside Diameter in Inches—½	⅝	¾	⅞	1	1⅛	1¼
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.50	3.65	3.60
Cold drawn, flat or square‡	4.00	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire, New York, $\frac{3}{32}$, 8.35c.; $\frac{1}{8}$, 7.85c.; $\frac{5}{32}$ to $\frac{1}{2}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			24.75
Tin, Straits, pigs, New York			51.00
Lead, pigs, E. St. Louis	6.85	New York	8.50
Zinc, slabs, E. St. Louis	6.80	New York	8.50

	New York	Cleveland	Chicago
Antimony, slabs	12.50	13.00	14.25
Copper sheets, base	33.75	33.75	32.00
Copper wire, base	29.37½	24.50	24.87½*
Copper bars, base	32.25	32.25	31.25
Copper tubing, base	35.12½	35.12½	34.12½
Brass sheets, high, base	27.12½	27.62½	26.37½
Brass tubing, high, base	32.00	32.50	31.25
Brass rods, high, base	24.87½	25.37½	24.12½
Brass wire, high, base	27.62½	28.12½	26.37½

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%	25.00*	24.30	24.30
Zinc sheets (casks)	10.50@11.00	11.70	10.11
Solder (½ and ½)	35.00	34.00	31@34
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade			70.00
Commercial genuine, intermediate grade			54.00
Anti-friction metal, general service			31.50
No. 4 babbitt			12.75

*Delivered.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold rolled	53.00	40.00†
Tubing	75.00*	90.00
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Cold drawn.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity offered for sale:

	New York	Cleveland	Chicago
Crucible copper	14.50 @15.00	19.00	13.00 @14.00
Copper, heavy, and wire	12.50 @14.50	18.75	12.00 @13.00
Copper, light, and bottoms	11.25 @12.25	16.50	11.00 @12.00
Heavy lead	5.75 @ 6.00	6.25	5.00 @ 5.50
Tea lead	4.00 @ 4.50	4.25	4.00 @ 4.50
Brass, heavy, yellow	8.00 @ 8.50	12.00	8.00 @ 8.50
Brass, heavy, red		16.00	12.00 @12.50
Brass, light	7.00 @ 7.50	11.00	8.00 @ 8.50
No. 1 yellow rod turnings	9.00 @ 9.50	12.50	10.00 @10.50
Zinc	3.25 @ 3.75	3.25	3.00 @ 3.25

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.†	.16	38.00 per M	.16
Sal soda, per lb	.02½	.02	.02
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb	.109	.11	.113
Cutting oil, about 25% lard, in 5 gal. cans, per gal	55	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal	.33	.36	.35
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30– 5%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade	50%	50–10%	50%
Second grade	60%	60– 5%	50–10%

*All waste in bale lots. †100-lb. bales.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0325	$0.0325	$0.0325
Cold drawn shafting	per lb.	.035	.035	.034
Brass rods	per lb.	.24871/2	.215	.165
Solder (½ and ½)	per lb.	.35	.3475	.34
Cotton waste, white	per lb.	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia	per 100.	3.60	3.59	3.10
Lard cutting oil	per gal.	.55	.55	.65
Machine oil	per gal.	.33	.33	.30
Belting, leather, medium	off list.	30–10%	30–10%	35%
Machine bolts, up to 1x30 in., full kegs	off list.	50-10%*	50–10%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper	$4.50	$4.29	$4.29
Emery cloth	22.93	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper	2.64	2.04	2.04
Cloth	3.60	3.59	3.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville, 2.75@2.90		
Coke, prompt foundry, per net ton	Connellsville, 3.75@4.50		
White lead, dry or in oil	100 lb. kegs	New York, 13.75	
Red lead, dry	100 lb. kegs	New York, 13.75	
Red lead, in oil	100 lb. kegs	New York, 15.25	

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	60%
Larger, up to 1 x 30-in., full kegs, list less	50–10%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	60%
Larger, list less	50–10%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.50
Structural, round head, broken kegs, net	6.00
Tank, 7–16-in. dia. and smaller, list less	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	60%
Larger, up to 3-in., list less	40–10%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$4.00
Wrought, broken kegs, per 100 lb., list less	2.00
Turnbuckles:	
With stub ends, list less	20%
Without stub ends, list less	50%
Chain:	
Proof coil, base, per 100 lb., net	$7.10
Cast iron welding flux, per lb., net	.40
Brazing flux, per lb., net	.80

Machine Requirements and Industrial Construction

Equipment Wanted

Mich., Detroit — Detroit Steel Products Co., 2250 East Grand Blvd.—machinery and equipment for fabricating steel sash for proposed 1 and 2 story, factory at Mound and Caniff Rds. Estimated cost $250,000.

Mich., Marysville—Athol Mfg. Co.—miscellaneous equipment for proposed 1 story, 30 x 150, 40 x 205 and 90 x 280 ft. automobile top factory. Estimated cost $60,000.

Mich., Marysville—Pressed Metals Co. of America—presses for proposed plant expansion.

Mo., St. Louis—Fire Dept., City Hall—will soon receive bids for two gear head lathes, single surfacer, etc. for Fire Dept. repair shops.

N. J., Montclair—Bd. of Education, T. P. Reagen, Secy., 22 Valley Rd.—will receive bids until May 6 for manual training equipment, etc., for public schools for the year 1929-1930.

N. Y., New York — Delaware, Lackawanna & Western R.R., 90 West St., C. C. Hubbell, Purch. Agt.—receiving bids for machine tools including engine lathes; turret lathes; bolt lathes; production lathe; milling machine; hydraulic forcing press; radial drilling machines; milling machine; bolt threading machine; floor grinder; internal grinder; drill press; pipe cutter; bolt pointing machine; upsetting and forging machines; double end hot saw and burring combination wet and dry grinder; back geared crank shaper; heavy duty portable cylinder joint facing machine and quartering machine for crank pins.

N. C., North Wilkesboro — Superior Williams Mill Co.—heavy and light machine tools for machine shop, slightly used machinery of the better makes and late type preferred.

O., Cleveland—Cleveland City Forge Co., c/o R. Tyler, East 45th St. and Lakeside Ave.—No. 56 Toledo trimming shear, back geared.

O., Marion — Marion Poured Concrete Brick Co., S. M. Wooley, Pres.—machinery and equipment including drill press, grinder, etc. for machine shop.

Ont., Guelph — Guelph Stove Co. — machinery and equipment for the manufacture of stoves for proposed foundry. Estimated cost $250,000.

Opportunities for Future Business

Calif., Berkeley—Hall Scott Motor Car Co., Hinz Ave., awarded contract for a 1 story factory on 7th St. Estimated cost $25,000.

Conn., Bridgeport — Bridgeport Brass Co., R. E. Day, Gen. Mgr., awarded contract for a 1 story, 40 x 120 ft. tube mill, etc. Estimated cost $100,000.

Conn., Derby — Hershey Metal Products Co., c/o Kinne & Palmer, 256 Main St., Archts., awarded contract for a 1 story, 60 x 100 ft. factory. Estimated cost $40,000. Noted Apr. 4.

Ill., Chicago — J. B. Fischer, 140 South Dearborn St., Archt., is receiving bids for a 4 story addition to factory for the manufacture of wood and machine screw, set screws, nuts, etc. for Chicago Screw Co., 3436 Fillmore St. Estimated cost $120,000.

Ill., Chicago — H. Kramer & Co., 2125 Loomis St., will soon award contract for the construction of a smelter at Loomis St. from 21st St. to 21st Pl. Estimated cost $100,000.

Ill., Chicago—Quality Hardware & Machine Co., 5845 Ravenswood St., awarded contract for a 1 story, 76 x 150 ft. addition to machine shop. Estimated cost $20,000.

Ill., Chicago—Universal Stamping & Mfg. Co., 2839 North Western Ave., awarded contract for a 2 story, 107 x 174 ft. factory for the manufacture of metal specialties, screw machine products, gear cutting and plating and polishing equipment. Estimated cost $50,000.

Ill., Chicago—Western Electric Co., Hawthorne Station, awarded contract for a 1 story, 52 x 63 ft. addition to plant at 2200 South Kenneth Ave. Estimated cost $50,000.

Ill., East St. Louis—Mobile & Ohio R.R., St. Louis, Mo., awarded contract for the construction of a roundhouse and other facilities at Cahokia Yard near here. Estimated cost $400,000.

Ill., Franklin Park—Joslyn Mfg. & Supply Co., B. S. Mandwork, Pres., 120 South La Salle St., awarded contract for a 1 story factory here. Estimated cost $75,000.

Ill., Rock Island—Reynolds Engineering Co., manufacturers of jigs, tools, etc. awarded contract for a 1 story, 50 x 106 ft. addition to plant at 5th Ave. and 38th St.

Ind., Jasper—New Indiana Chair Co., is receiving bids for a 2 story, 300 x 300 ft. factory. Estimated cost $75,000. E. C. Berendes, 108 McCurdy Bldg., Evansville. Noted Mar. 28.

Me., North Anson — North Anson Mfg. Co., J. P. Elton, Pres., 1495 Thomaston St., plans to rebuild woodworking plant recently destroyed by fire. Estimated cost $100,000. Private plans.

Md., Baltimore—G. L. Martin Co., Colgate, awarded contract for a 1 story, 302 x 903 ft. aircraft factory here. Estimated cost $1,250,000. Noted Apr. 4.

Mass., Dorchester (Boston P. O.)—D. R. Campbell Machine Co., Mildred Ave., awarded contract for a 1 story, 40 x 60 ft. machine shop.

Mass., East Boston (Boston P. O.)—Bay State Casket Co., Elbow St., is receiving bids for a 4 story, 60 x 65 ft. factory on Summer St. Estimated cost $45,000. M. E. Levy, 43 Tremont St., Boston, Archt.

Mass., East Boston (Boston P. O.) — Bethlehem Shipbuilding Corp., 100 Milk St., Boston, awarded contract for a 1 story, 90 x 225 ft. machine shop here, also 2 story addition to joiner shop at Quincy. Estimated cost $60,000. Noted Apr. 4.

Mass., New Bedford—Norlander Machine Co., 463 South First St., is having plans prepared for a 1 story machine shop. A. L. Lucus, North Dartmouth, Archt.

Mass., Revere (Boston P. O.)—American Galvanizing Co., 83 Florence St., will build a 1 story, 50 x 100 ft. plant at Everett and Beach Sts. Private plans.

Mass., Somerville (Boston P.O.)—J. L. Porter, Oxford St., Cambridge, awarded contract for a 1 story machine shop at 50 Grove St.

Mass., Somerville (Boston P. O.)—Whitney Barrel Co., J. Whitney, Pres., 117 Linwood St., awarded contract for a 1 story, 75 x 130 ft. addition to factory.

Mass., Worcester—Thompson Wire Co., 115 Stafford St., awarded contract for a 1 story, 60 x 110 ft. factory. Estimated cost $40,000.

Mich., Detroit—Detroit Lead Pipe Co., 600 West Larned St., awarded contract for the construction of a factory on Liveronis St. Estimated cost $150,000.

Mich., Detroit—Johnston & Jennings, Addition Rd. and New York Central R.R., Cleveland, O., awarded contract for the construction of a foundry here. Estimated cost $60,000.

Mich., Grand Rapids—Prest-O-Lite Co., subsidiary of Union Carbon & Carbide Co., 30 East 42nd St., New York, N. Y., will receive bids about Aug. 1 for the construction of a plant. Estimated cost $125,000. Private plans.

Mich., Pontiac—Hancock Iron Works, 52 West Pike St., plans a 1 story, 150 x 500 ft. plant on Paddock St. Private plans.

N. J., Perth Amboy—Raritan Copper Works, Elm St., will receive bids about May 1 for a 1 story addition to plant. Estimated cost $60,000. Private plans. Noted Apr. 18.

O., Cincinnati—Crosley Radio Co., Colerain Ave., will soon award contract for an 8 story factory. Estimated cost $500,000. Noted Jan. 24.

O., Cincinnati—United Casket Co., 1958 Central Ave., will soon award contract for a 2 story factory. Estimated cost $40,000.

O., Cleveland—Clark Controller Co., P. C. Clark, Pres., 1145 East 152nd St., awarded contract for a 1 story, 40 x 120 ft. addition to factory. Estimated cost $40,000.

O., Cleveland—A. Claus Mfg. Co., 5250 Brookpark Rd., manufacturers of wood store fixture manufacturers, awarded contract for a 1 story, 60 x 150 ft. addition to factory, etc. Estimated cost $40,000.

O., Cleveland—Marble & Shattuck Chair Co., T. W. Foote, Mgr., 10200 Foster Ave., awarded contract for a 1 story addition to factory. Estimated cost $40,000.

O., Cleveland—National Lamp Works of General Electric Co., Nela Park, awarded contract for a 1 story, 104 x 140 ft. addition to plant at 1175 East 152nd St. Estimated cost $40,000.

O., Gallipolis—Logan Furniture Co., is having plans prepared for a 2 story, 75 x 115 ft. factory. Estimated cost $30,000.

O., Elyria—Fox Furnace Co., M. Suppes, V. Pres., 206 Washington Ave., awarded contract for addition to foundry and factory. Noted Mar. 7.

Pa., Bedford—May & Bigley, Altoona, will build a 2 story, 54 x 100 ft. factory for the manufacture of insulators here. Estimated cost $50,000. D. G. Puderbaugh, Altoona, Archt.

Pa., Irvineton (mail Irvine)—National Forge & Ordnance Co., will build a 1 story, 160 x 300 ft. addition to steel plant. Estimated cost $100,000. Work will be done under the supervision of B. R. Shover, Cliver Bldg., Pittsburgh, Engr.

Pa., New Kensington—Aluminum Co. of America, Oliver Bldg., Pittsburgh, is having plans prepared for the construction of a laboratory here. Estimated cost $500,000. R. P. L. Hogner, Engr.

Pa., Philadelphia—Brown Instrument Co., Roberts and Wayne Sts., will soon award contract for a 2 story, 79 x 219 ft. plant. Ballinger Co., 12th and Chestnut Sts., Archt.

Pa., Philadelphia—E. G. Budd Co., 25th and Hunting Park Ave., manufacturers of automobile bodies, awarded contract for a 2 story, 31 x 142 ft. addition to factory at Hunting Park Ave. and Stokeley St. Estimated cost $23,000.

Pa., Philadelphia — Dodge Steel Corp., Hellerman St. and State Rd., awarded contract for a 1 story, 81 x 116 ft. addition to foundry.

Pa., Pittsburgh—Miller Saw Trimmer Co., Point Bldg., will soon award contract for a 1 and 2 story, 84 x 157 ft. addition to factory on Sproat Way. Estimated cost $150,000. Hunting Davis & Dunnells, Century Bldg., Archts.

Pa., Washington—Washington Mild Machinery & Foundry Co., is having plans prepared for a 1, 2 and 3 story foundry on West Beau St. Estimated cost $40,000. Carlem Engineering Co., 6949 Lynn Way, Pittsburgh, Engr.

Ont., Toronto—Standard Radio Mfg. Corp Ltd., 90 Chestnut St., plans the construction of a factory. Estimated cost $203,000.

Ont., Toronto—Toronto Iron Works, Royal Bank Bldg., had plans prepared for a plant to include machine shop, punch and shear shop, etc. Estimated cost $150,000.

Japan Tokyo — Nippon Electric Co., awarded contract for addition to factory. Estimated cost $250,000.